# GAS JOURNAL

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## WAR DAMAGE

IT is unlikely, in view of the imminence of nationalization, that the present owners of the gas industry will be concerned with payments or receipts under the War Damage (Public Utility Undertakings, &c.) Bill, but it may be assumed that in the majority of cases the present personnel will handle the negotiations that will be involved in implementing the Bill. For that reason we deal at some length in this issue with the report on the Bill which has been circulated to member undertakings of the British Gas Council. It will be noted that the contributions to be made by individual undertakings are to be fixed by an Order to be made by the Treasury, but that the method by which the amount of such contributions are to be assessed is not specified in the Bill. The British Gas Council, in negotiations with the Treasury and the Ministry of Fuel and Power, recommended that the assessment should be on the basis of the average annual sales during the four financial years 1941-1944, excluding gas sold in bulk to other undertakings and gas purchased unpurified by the undertakings from coke ovens and not passing through the works, plant, or mains of the undertaking.

On this basis the total contribution of each individual undertaking can now be estimated as 0.4729d. per therm on the average sales for the four years mentioned, as against 0.4d. per therm estimated six months ago. This information has been circulated to enable undertakings to adjust any reserve tentatively made against this liability. It should be noted, however, that the Bill provides that the contributions made by public utility undertakings "shall be treated for all purposes as outgoings of a capital nature" and authorizes such undertakings to raise by means of borrowing, or otherwise. such sums as may be required to satisfy their liability under the Bill. Normally payments are to be made to those carrying on the undertaking at the time of the damage, and contributions are to be paid by those carrying on the business on May 8, 1945, but where there has been a change of ownership or other circumstances the Treasury may make payments to and levy contributions upon any other body if such course appears to be requisite or equitable. The Area Gas Boards will take over the rights and liabilities of the present owners in these respects.

## SULPHATE OF AMMONIA

THE Annual Report of the British Sulphate of Ammonia Federation, the 28th of which, covering the 51st year of nitrogen propaganda by the Federation, its predecessors, and its associates, is summarized elsewhere in this issue, is an annual reminder of one aspect of the service rendered by the gas industry which is not always appreciated. Not only does the industry produce a substantial proportion of the total yield of sulphate of ammonia, but it also provides the solid smokeless fuel—coke—and in some cases the gas, employed in the co-operative grass-drying schemes which have formed an important part of the agricultural development in which the Federation has been interested in recent years.

Production of ammonia products in the British Isles fell from 1,430,000 tons in 1946 to 1,325,700 tons in 1947, but the home agricultural consumption rose from 556,063 tons to 661,500 tons. Exports from the United Kingdom dropped from 247,801 tons in 1946-47 to 240,598 tons in 1947-48. For 1929-30 exports totalled 654,973 tons, since when they have ranged from just over 206,000 tons to 321,000 tons per annum, except in the critical war year 1943-44, when they fell to 60,683 tons. As usual, the largest purchasers of British sulphate of ammonia were India, Pakistan, Burma, and Ceylon, though their totals were somewhat less than in the previous year; on the other hand, the British West Indies took 17,409 tons last year against 12,535 tons in 1946-47.

The report emphasizes that the full benefit of the use of sulphate of ammonia and other fertilizers on grassland can only be obtained in conjunction with sound management of grazing and conservation by the processes of silage and drying. Both of these processes have made considerable progress during the year. In our issue of Jan. 14, 1948 (pp. 105-106) we described an experimental co-operative coke-fired grass-drying installation at Thornbury, Gloucestershire—the result of collaboration between the Milk Marketing Board and Imperial Chemical Industries, Ltd. It is of interest to note from the latest report that the experiment was sufficiently promising for an extension to be made during the year, and 10 co-operative drying centres have been brought into operation by the Milk Marketing Board. The initial experiment stimulated activity in contract drying by farmers' co-operative organizations, and several centres have been established on a commercial basis. Research and propaganda have proceeded hand in hand, and nitrogen consumption during the year was the highest ever achieved in this country.

## "GAS SERVICE," 1949

THE year 1949 promises—and threatens—to be one of considerable change, if not upheaval. Within the industry it is anticipated variously. On one score at least our feelings are optimistic for we started the New Year with a resolution achieved. The upgrading of a periodical in these days of paper shortages and snowballing printing costs is not an easy thing to achieve. In spite of this, we regard the January issue of "GAS SERVICE" with some pride, for with it most of the austerity measures produced by the war have been overcome. It will be remembered that "GAS SERVICE" commenced its life as a modest supplement to the "GAS JOURNAL" in 1922 and grew to be an independent paper in 1930. The sharp axe of the Board of Trade fell in 1941, whittling its former lavish production to a pocket size publication. It is true that we were not alone in relegation to lilliputian dimensions, and in common with other periodicals we even enjoyed a certain added popularity due to the readiness with which

these periodicals could be carried in the pocket. Through the years which followed we strove to use our slender allocation to the best advantage. With the aid of an increased number of pages in 1946, and again during 1948, we were able to present a journal which could not only claim to be the only trade periodical catering exclusively for the sales and distribution staffs, but a miniature Goliath carrying the only full reports of the various Gas Salesmen's Circles and a wealth of news from the service side of the industry. However, no pocket format can present news and illustrations attractively. No matter what layouts and typographical arrangements were employed, the small size remained an impassable barrier. It is with the satisfaction of frustration eased and the knowledge of an improved service to the industry that we usher in the 1949 "GAS SERVICE," an old and trusted friend in a new guise, with an increased overall size, redesigned cover, and many new features. The January issue gives prominence to a detailed account of the gas installation in a new school, a provocative article on the use of copper for gas services, and many news items, not the least of which are reports of recent Salesmen's Circle meetings. Every effort is being made to widen the scope of "GAS SERVICE," to provide more specialized information for the hitherto somewhat neglected technicians whose work lies somewhere between the holder and the consumer's applianee, and to present in as attractive manner as possible topical news of the industry from Land's End to John o' Groats. That our plans are ambitious and far reaching will be revealed and realized in future issues; that our present efforts are appreciated is guaranteed by the immediate response to the first number. The gas industry of 1949 is assured of a publication carrying the hall-marks of tradition and serving a large and important section of the industry.

## *I.G.E. BULLETIN*

We have received from the Institution of Gas Engineers the first issue of a Bulletin which it is proposed shall be published at two-monthly intervals, the aim being to create a closer link between the Institution and each of its members. As the President, Mr. E. Crowther, emphasizes in a foreword, it is not intended in any way to detract from the value of the Gas Press or to duplicate its work. The object is to set out certain information concerning the work of the Institution and its Committee, to record the movements of members, and to give advance notice of forthcoming events of interest to members. We think that, in its modest form, and with the growth in membership, the Bulletin is likely to serve a useful purpose.

## *PRODUCTIVE EFFICIENCY*

Papers given at a conference on the Measurement of Productive Efficiency organized by the Institution of Production Engineers and the Institute of Cost and Works Accountants have picked out some defects in British practice in this field. Referring to the conclusions of Working Parties set up to review the conditions and prospects of many of the country's important industries, one speaker said that the findings of these bodies emphasized the paucity of comparable statistical information on which to base comparison of the efficiency of firms within the same industry. The lack of control information over a wide field of British industry constituted a challenge not only to industrial management but to members of professional bodies whose main contribution to the solution of industrial problems lay in their ability to carry out operational research with a view to fixing attainable standards of output. Another speaker said that on the operational side we have only begun to tread the right road, and if we accept the necessity in our country for greater production efficiency we certainly must make a stronger attempt than at present to travel that road. One of the most important factors of operational research was measurement of productivity, but at the moment this was based more on opinion than fact. These ideals for operational information were set up in one of the papers—it should include: attainable production under normal conditions in terms of hours and effort achievable; actual process hours of output achieved; based on operational research, the budgeted or estimated cost of operating individual processes or groups of like processes at attainable level of production; actual cost incurred; expected cost per hour per operating process at attainable levels of production efficiency; and the actual variation in cost based on these standards.

## *PUBLIC SERVICES*

A loss of £30 mill. or thereabouts seems probable on the 1948 working of British Railways. This is suggested in the New Year message to the staff of the British Transport Commission by the Chairman, Sir Cyril Hurcomb, and the news was made all the more inauspicious coming on the day that London 'bus drivers decided to strike for higher pay. "Throughout the year," Sir Cyril says, "excellent relations have prevailed between the Commission and the trade unions," and he urges the need for all ranks and grades to co-operate as partners in the work of making transport services more efficient. The Commission, he states, has the duty of making British transport self-supporting. "The urgency of this task is emphasized by the decline in earnings, more particularly on the railways, during the past year. When the railways increased their fares and charges in October, 1947, it was estimated that they alone would have to earn an additional £65 mill. per annum to make ends meet. The final results for 1948 cannot be known for some time yet, but it is clear that earnings are falling short of expectations; at the end of November the railways' additional earnings had only just reached £34 mill. Since the railways bring a very high proportion of the income accruing to the commission, this shortfall is bound to have a serious effect on the commission's finances generally." Nationalized transport has not been in the limelight to anything like the extent of coal though on it and its cheapness the national economy bears quite as heavily.

## *CAPITAL FOR INDUSTRY*

The Federation of British Industries has now thrown its weight on the side of those who have been urging tax changes to allow the repletion of industry's capital resources. It has sent a letter to the Chancellor of the Exchequer urging changes in taxation which would alleviate the lack of capital for the replacement or modernization of fixed assets and the growing shortage of working capital. While prices have more than doubled since pre-war years, profits have been restricted by price controls and by the tax on undistributed profits. It has, the Federation claims, been therefore impossible for a large number of industrial companies to accumulate the additional capital required out of current earnings. The result is "a real risk of industrial decline" unless some relief is given at once and the Federation's letter proposes two interim measures. The first is a special fixed allowance to make up the difference, or part of it, between normal depreciation allowances and replacement costs: this, it is suggested, might be equal to the whole depreciation allowance actually granted in 1945-6, the last year before post-war re-equipment started, but adjustments will be necessary to allow for special cases. The second proposal is that the shortage of working capital and finance to carry larger stocks might be dealt with by "substantial reduction" in taxes on undistributed profits during 1949-50 and until notice. These are the Federation's short-term proposals and to deal with the problem fully it suggests an official inquiry to examine whether profits could be so calculated for taxation purposes as to allow for marked changes in the value of money upwards or downwards.

## *INDUSTRIAL FINISHING*

It is seldom that industrial finishing is spoken of as an industry. The reason is probably that the scope of industrial finishes is so wide and embraces so many widely diverse industries, some of them keenly competitive, that it is difficult to appreciate the degree of co-operation and consolidation which exists between all whose work lies in this essential and highly skilled sphere. This unity will be effectively demonstrated when an Industrial Finishes Exhibition is held at Earl's Court from Aug. 31 to Sept. 13. Initially sponsored by the Council of Industrial Design, the exhibition has the approval of Government Departments, technical associations, and industry in general. One of its principal aims is to demonstrate to the foreign buyer that in this country manufacturers are "finishing conscious." This aspect was emphasized by Mr. E. A. Ollard, Chairman of the Advisory Technical Committee, at a Press Conference on Friday. There were, he said, too many articles being exported with finishes of inferior quality. In some cases this was due to ignorance on the part of the manufacturer who selected finishes unsuitable for the

articles in question. In order that the manufacturer may be encouraged to find the type of finish best suited to his product, expert sub-committees have been set up to cover the following categories of industrial finishes: Vitreous enamelling, organic finishes, natural finishes, dipped coatings, sprayed coatings, electro-deposition precious metals, electro-deposition base metals, chemical and electrolytic finishes on aluminium, and finishes on steel.

## *EAST WIGHT'S PRESSURE HOLDER*

To remove any doubts as to either the contractors' or our arithmetical abilities it seems well to explain a difference of a matter of 33,000 cu.ft. between the capacities given in last week's specially contributed article on the East Wight Gas Company's new pressure holder and our own editorial reference to it. The author gave the figure of 150,000 cu.ft. from the working pressure of 50 lb. per sq. in. down to 10 lb. per sq. in.; the figure given editorially—188,000 cu.ft., taken from figures given to us by the contractors a few weeks ago—referred to the capacity from the working pressure down to 0 lb. per sq. in. Although the apparent discrepancy may be explained simply it may not be obvious at first sight. In comparisons between pressure holders it is common to use as a criterion the releasable capacity from the design pressure down to 0 lb. per sq. in., but the user of a holder is more interested in the actual volume releasable under working conditions. The former might be called the nominal capacity, and the latter the working capacity. In calculating the working capacity the lower pressure is not always 0 lb. per sq. in. (*e.g.*, it is 10 lb. per sq. in. at Shanklin) and this gives rise to variations. In the case of Shanklin, therefore, the figure quoted editorially was in fact neither the nominal nor the working capacity. To recapitulate: The volume of the vessel is 55,200 cu.ft.; nominal capacity (from design pressure to 0) is 207,000 cu.ft.; working capacity (working pressure to 10 lb. per sq. in.) is 150,000 cu.ft.; our quoted capacity (from working pressure to 0) is 188,000 cu.ft.

## *INTERNATIONAL EXCHANGE OF STUDENTS*

We have received from the Secretary, Mr. J. Newby, the first annual report of the International Association for the Exchange of Students for Technical Experience, in which it is clearly shown that the foundation of the Association has been fully justified by the progress achieved in the multilateral exchange of students between the founding members. During the past year the main effort has been focused on the development of international machinery to deal efficiently with the interchange of students. Considerable success has undoubtedly been achieved. The machinery of the Association ensures that individuals nominated are sponsored by the universities and colleges participating and that the acceptance of nominations through the Association provides opportunities for students on a reciprocal basis. During the summer vacation of 1948 the numbers of students interchanged as far as Great Britain was concerned were 191 incoming, 194 outgoing. The students were drawn from Birmingham University, Camborne School of Mines, Cambridge University, Chelsea Polytechnic, Durham University, Glasgow University, Imperial College, Northampton Engineering College, Sheffield University, Southampton University College, University College, London, and Wolverhampton and Staffordshire Technical College. The outstanding development during the year was the decision of the Governors of the Imperial College to broaden in 1949 the exchange machinery already in existence to include undergraduate students from other universities and colleges in Great Britain. Several of these have already indicated their willingness to co-operate with the central organization in 1949. In the Association's report the helpful co-operation of many bodies and industrial concerns is recorded, including the Gas Research Board, the Gas Light and Coke Company, the South Metropolitan Gas Company, and many of the firms whose announcements appear in our advertisement pages.

# Personal

Mr. W. M. JOBLING, Sales Manager of the Sunderland Gas Company, has retired after 45 years' service.

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A family association of 70 years with the March Gas and Coke Company has been broken by the retirement of Mr. CHARLES GREENWOOD, for nearly 43 years Secretary of the Company. His father, the late Mr. Charles Greenwood, was Secretary from 1880 to 1906.

Mr. H. CHADWICK, of Keighley, Yorks., has been appointed Technical Assistant with the Market Harborough Gas Department.

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Mr. O. R. GUARD has resigned from the Board of United Drapery Stores, Ltd., owing to his appointment as Chairman of the Southern Area Gas Board.

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After two years with the Airdrie Gas Department, Mr. CHARLES REID has been appointed Manager of the Lydney (Glos.) Gas Light and Coke Company. Mr. G. E. H. Keillor, Engineer and Manager at Airdrie, presided at a presentation ceremony held before he left at which Mr. David Angles, Assistant Manager, made a presentation on behalf of the staff.

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Colonel HAROLD C. SMITH, C.B.E., D.L., has resigned his Managing Directorship of the Tottenham and District Gas Company and its associated Companies consequent on his appointment as Deputy Chairman of the Gas Council. He retains his seat as Deputy Chairman of the Tottenham and associated Companies. Colonel Smith joined the Tottenham Company as Superintendent of Willoughby Lane Works in 1920. He was appointed Chief Engineer in 1922.

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Many tributes were paid to Mr. G. E. CURRIER, Engineer and Manager of the Bradford Gas Department, for the manner in which he had inspired his Department during the past 16 years, when he was presented last week with a silver tankard and an illuminated book of signatures of members of the staff to mark his departure to take up his appointment as Deputy Chairman of the Northern Area Gas Board. Making the presentation, Mr. H. Johnston, Deputy Engineer and Manager, remarked on Mr. Currier's capacity for hard work and his ability to get others to work with him.

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Alderman GEORGE CLARK, Chairman and Managing Director of the Bryan Donkin Co., Ltd., and for 31 years Chairman of the Chesterfield Gas Committee prior to his retirement in 1944, who, as reported last week, was the recipient of the O.B.E. in the New Year Honours, was entertained to luncheon by his fellow Directors on his 88th birthday on Jan. 4. Major D. Abel Smith, the Vice-Chairman, presented to him on behalf of the Directors his portrait painted in oils. An accompanying address stated that it was in recognition of his constant efforts, extending over nearly 56 years, with sincere good wishes and the hope that it would revive pleasant memories of a happy relationship formed and retained throughout those many years between him and the Directors, shareholders, staff, and workpeople.

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Messrs. F. P. DYSON, H. KERR, and A. F. TOPLEY have been appointed Directors of the Woodall-Duckham Vertical Retort and Oven Construction Co. (1920), Ltd. Mr. Dyson joined the Company in 1927 as an outside constructional engineer and, after being in charge of a number of important contracts in this country and abroad, was appointed Engineer-in-Charge of the drawing office in 1940. In 1946 he was appointed Chief Engineer of the construction department. Mr. Kerr joined the Company in 1929 and has served throughout on the staff of the operating department, being appointed in 1939 Chief Engineer in charge of operation of all plants built by the Company for the gas and coking industries. Mr. Topley joined the Company in 1913 and after experience in the erection of plant joined the sales department (gas). Since 1929 he has been deputy to the head of sales department (gas) and now is head of that department. Mr. J. SIMPSON has been appointed a Director of Woodall-Duckham, Ltd.

## GAS BOARD APPOINTMENTS

One whole time member and four part-time members have been appointed to the Wales Gas Board newly set up under the Chairmanship of Mr. T. Mervyn Jones. The whole time member is Mr. EDWARD MORGAN EDWARDS, M.Inst.Gas E., A.M.I.Mech.E., aged 45, Engineer and Manager of the Port Talbot Borough Gas Department since 1932. He receives the salary of £3,000 a year. Part-time members are Mr. JOHN C. CLAY, J.P., aged 55, a Director of Cardiff Gas Light and Coke Company, and former captain of Glamorgan Cricket Club; Alderman J. E. EMANUAL, aged 47, an industrial worker and former Mayor of Neath; Mr. WILLIAM JONES, C.B.E., aged 64, of Ruthin, Clerk to the Denbigh County Council since 1930, and Welsh Regional Controller, Ministry of Fuel and Power, 1942-1945; and, finally, Mr. FRANK E. PRICE, aged 47, of Brecon, Partner in Alban and Lamb, Financial Advisers to Local Authorities and Public Utility Undertakings. Each receives a salary of £500 a year.

Mr. Edwards served his apprenticeship to the industry with Mr. W. Clark Jackson, of Neath, and went from there to Bournemouth, returning to Port Talbot as Engineer and Manager of the local undertaking in 1932. He was early associated with the activities of the Wales and Monmouthshire Association, serving as Secretary, and, in 1946, President. He has contributed a number of papers of exceptional interest and merit, and was always a constructive contributor to the discussions. He recently came into prominence

for his excellent work on the Working Party Report. He is a member of the Institution of Gas Engineers and is one of the few Welshmen who hold a diploma of the Institution. He is also a member of the Central Committee of the Federation of Gas Employers and of the National J.I.C. for the Gas Industry.

Mr. Alex W. Lee, General Manager and Secretary of Birmingham Gas Department since 1945, has been appointed the first full-time member of the West Midlands Area Gas Board. Making this announcement at the meeting of the Birmingham City Council on Jan. 4, the Chairman of the Gas Committee, Councillor Seymour J. Brown, said that while there had been some disappointment that the Birmingham undertaking—the second largest in the country—had been overlooked in the selection of chairman and deputy-chairman for the area, Mr. Lee's appointment was some consolation. He congratulated Mr. Lee on his new post and remarked that it would necessitate the appointment of a new executive chief for the Department and possibly other staff changes.

Mr. Lee was born on July 8, 1890, in North Queensland, Australia, and joined Birmingham Gas Department in 1908. During the first world war he served with the Warwickshire Regiment in France and after recovering from wounds received on active service was commissioned in the Royal Machine Gun Corps, serving in Mesopotamia and Persia until 1919. He became Assistant Secretary of the Birmingham undertaking in 1935 and was appointed General Manager and Secretary in 1945. He is the Midland representative on the Executive Committee of the British Gas Council and Federation of Gas Employers, and sits on the Advisory Committee to the Ministry of Fuel and Power.

## MANCHESTER JUNIORS' JUBILEE

The Manchester and District Junior Association of Gas Engineers has lately attained its 50th anniversary, and to mark the occasion this year's President, Mr. H. N. Dann, has written an exceptionally interesting record of the Association's development and progress, with a foreword by Sir Frederick West. The whole Junior Gas Association movement may be said to have originated in Manchester, for the Association was the first of its kind, and as the others developed over the ensuing years Manchester led the way in bringing into being the British Junior Gas Associations' Joint Council.

Sir Frederick West rightly remarks in his foreword that the Junior Associations are proving themselves worthy of the industry and their proceedings are making a distinctly valuable contribution to its development. In his William Young Memorial Lecture in 1938 Sir Frederick urged that every facility should be afforded to technical officials to participate in the meetings of the technical organizations. "I would go further," he now writes, "I would say that they (the heads of the industry) should insist on their junior technical officials joining a Junior Association as an essential part of their training, and it is hoped that the Area Boards by whom the industry will shortly be controlled, will adopt a similar policy."

The commemorative book recalls that the Association began because there was a deficiency of classes for the young men in the industry. Mr. E. J. Wellens, then of Middleton, who became the first Secretary and was eventually President, made representations to the Principals of the Manchester and Salford Technical Schools, resulting in a class being formed in 1897 under Mr. Ashworth, then Chief Draughtsman in the Manchester Gas Department, with 50 students. The students wanted opportunities to discuss the questions that arose in the class, and the Association arose out of an impromptu meeting round a street lamp outside the College.

Throughout its history the Association has given high priority to matters of education, and Mr. Dann recalls in considerable detail the successful efforts of the Association in that direction. Although at the outset the attitude of the Seniors towards the Juniors was somewhat detached, valuable help in many directions was afterwards forthcoming. As early as 1908 the President of the Juniors (Mr. Wellens) was invited to a seat on the Senior Association, and in the same year the Juniors resolved that "The President and Secretary for the time being of the Manchester District Institution of Gas Engineers be *ex officio* members of the Council."

Mr. Dann's final chapter, dealing with kindred organizations, recalls a joint meeting of the Junior Associations on the occasion of the Manchester Gas Exhibition in 1907, leading some years later to the formation of the Junior Gas Associations' Joint Council—originally called "English," but afterwards changed to "British" after the Wales and Monmouthshire Junior Gas Association had become affiliated. For at least 28 years the Association has wondered whether anything could be done to eliminate the word "Junior" from the name of the various associations, but it has always been decided to leave the word in the title, a decision confirmed when the rules were re-written in 1947.

While the activities of the Council would seem to have passed through periods of great activity followed by periods of quiet, Mr. Dann concludes, it can be said that the body was invigorated again and again through its affiliation with the Institution.

# Diary

Jan. 14.—**Domestic Development Committee:** Joint Consultative Committee, Gas Industry House, 2.30 p.m.

Jan. 14.—**London and Southern Junior Gas Association:** "Some Problems of Heating and Hot-Water Supply in the Gas Industry," W. F. Moore, Assoc.I.H.V.E. (Wandsworth and District Gas Company), Gas Industry House, 7 p.m.

Jan. 14.—**Scottish Junior Gas Association (Western District):** Distribution paper, W. A. Green (Distribution Engineer, Paisley), Royal Technical College, Glasgow.

Jan. 17.—**London and Counties Coke Association:** Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m.; Gas Industry House.

Jan. 22.—**Yorkshire Junior Gas Association:** Discussion meeting, Wakefield.

Jan. 25.—**Southern Association of Gas Engineers and Managers (Eastern District):** "Ten Years' Experience of a Two-part Tariff," J. E. Davis, F.R.I.C., Principal Technical Officer, and R. F. Layton, Tariff Officer, South Metropolitan Gas Company. Gas Industry House, 2.30 p.m.

Jan. 26.—**Manchester and District Junior Association of Gas Engineers:** "Some Aspects of Oxide Purification," L. G. Townend, M.Sc., A.R.I.C. (Liverpool).

Jan. 29.—**Western Junior Gas Association:** "Accountancy," G. Sherlock (Torquay), Bridgwater.

## EDINBURGH JUBILEE CELEBRATIONS

In celebration of the sixtieth year of local authority ownership and the one-hundred-and-thirtieth anniversary of the introduction of gas supply to the City, Edinburgh Corporation Gas Department promoted a whist drive, cabaret, and dance in the Assembly Rooms, Edinburgh, on Dec. 23, 1948. The function, which was attended by over 900 employees, their wives and guests, was graced by the presence of the Lord and Lady Provosts, the Right Hon. A. H. A. Murray, O.B.E., and Miss Rodney M. Murray, and also of the Convener and members of the Gas Committee.

In a few brief remarks before the cabaret show, Mr. Duncan D. Melvin, Engineer and Manager, touched, among other things, on the early history of gas supply in the City and recalled that Sir Walter Scott, who had been a frequenter of the Assembly Rooms in which the function was being held, was chairman of one of the first private gas companies promoted in Edinburgh in the first half of the last century.

The Lord Provost spoke of the great civic pride with which the Department was regarded by the Corporation and citizens of Edinburgh and of its proud record of achievement in the past.

On the following afternoon 900 children of the Department's employees were entertained at a performance of the pantomime "Babes in the Wood," at the Gaiety Theatre. Equal success attended this venture and the show was greatly enjoyed by the juvenile audience.

In the group photograph taken at the function in the Assembly Rooms are (from left to right): Bailie R. West Russell, Convener, Gas Sub-Committee; the Right Hon. A. H. A. Murray, Lord Provost; Mrs. D. Beavis; Mr. A. F. Pollock, Assistant Manager; Mrs. D. D. Melvin; Mr. D. Beavis, Deputy Engineer and Manager; Miss Rodney M. Murray, Lady Provost; and Mr. D. D. Melvin, Engineer and Manager.

**Cheltenham and District Gas Company** has received instructions from the Ministry of Works to fix 124 Main No. 15 Thermain multipoint water heaters and gas meters in the married quarters at Bishop's Park Hostel. The heaters are to replace partly an existing small scale district heating scheme which also serves the single quarters. While this district heating scheme is small compared with some projects now being planned, all such schemes are liable to be costly in fuel consumption, due to the fact that the service, either room-heating or domestic hot water, or both, is unmetered.

## METER BY-PASSED

At Castletown (Isle of Man) High Bailiff's Court on Dec. 22, Leslie David Peace, of Port St. Mary, a Director of Ballasalla Creameries and manufacturer of potato crisps, was bound over for 12 months and ordered to pay costs on a charge of stealing gas.

Evidence was given by Walter Cole, Engineer, Manager, and Secretary of the Castletown Gas Light Company, that because the defendant had complained of inadequate gas pressure at night he called at his premises and found that the meter had been by-passed by means of a piece of rubber tubing. Returning a few hours later with the police he found that the meter had been re-connected, but the joints were only finger-tight and were leaking.

The defendant, in evidence, claimed that there was a serious leak in the pipes, and pressure was so low that the only way to carry on work was to by-pass the meter. Before connecting the rubber tube he put 10s. in the meter coin box to pay for the gas which was to be used.

## GLOUCESTER PROFIT SHARING SCHEME

Hope that the Gloucester Gas Light Company's profit sharing and saving scheme would be continued after nationalization, and that workers in the gas industry would derive even greater benefits from it in the future, was expressed by Sir Leslie Boyce, Chairman of the Directors and of the scheme, at the annual meeting of members on Dec. 13.

Sir Leslie, who was proposing adoption of the committee's report and accounts for the year ended June 30, 1948, said they would agree that the scheme had been an outstanding success over its entire life of 40 years. Since the inception of the scheme, total bonuses paid amounted to £40,142. Total interest paid on accumulated bonuses was £15,033, savings received £38,593, and interest on savings £4,376.

Colonel Studholme, the Company's Solicitor, had received written assurance from the Ministry of Fuel and Power that the scheme came fairly within the description contained in Clause 59 of the Gas Act, providing for employees to "participate in the profits" of the undertaking. The balance sheet figure to-day was £27,630, and if the scheme had to be wound up the assets would be distributed to members.

Sir Leslie announced that the Directors had again granted an ex-gratia bonus of 2% on wages and salaries earned by members of the scheme. The total bonus to be shared was £1,774, compared with £1,634 in 1937. The number of members on June 30, 1948, the report stated, was 349.

## CENSUS OF PRODUCTION

An Order prescribing the matters about which persons may be required to furnish returns for the Census of Production to be taken this year has been made by the Board of Trade. The Order exempts undertakings covering the production of coal, gas, electricity, oil shale, crude or refined petroleum or shale oil products from making Census of Production returns to the extent to which they supply such information to the Minister of Fuel and Power under Section 1 of the Statistics of Trade Act, 1947.

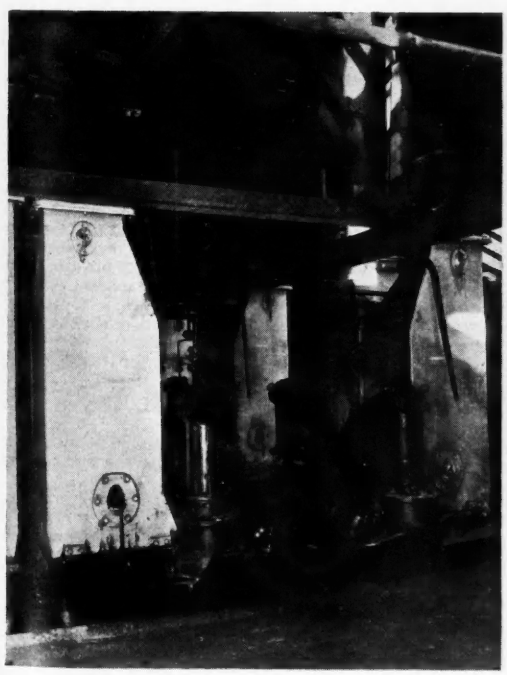
The Order is known as the Census of Production (1949) (Returns and Exempted Persons) Order, 1948. The Census, which will be taken early this year in respect of 1948 production, will be the first full Census of Production since 1935. A partial Census, covering 15 industries, was taken in 1947.

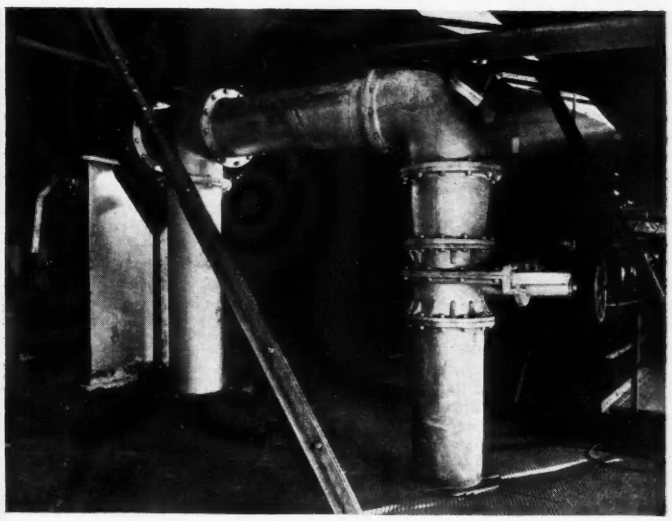
## GAS TURBINE DEVELOPMENTS

B.I.O.S. Overall Report No. 12 is devoted to an analysis of the many different German ideas which went into their gas turbine research and manufacture during the period from 1939 to 1945. The report deals with the design of the various components, such as compressors, turbines and blade cooling, combustion, fuel systems and heat exchangers; another section is concerned with a review of the various applications of gas turbines including the interesting Lurgi gas turbine, a 12,000 kW. power generation project which was intended to utilize gas from high pressure gasification of brown coal. A high capital cost could be off-set against an efficient power source from low grade fuel. Owing to their lack of high grade alloys, the Germans were forced to evolve various designs of hollow blades with internal cooling, partly by air and partly by water at its critical temperature. On rotary heat exchangers for gas turbines German developments were ahead of similar work in this country and much of interest can be learned from them. Another interesting piece of research was the use of mixed sintered iron and alumina to produce a material for blades at high temperatures.

The report contains 46 pages and several diagrams as well as 46 references to other published information on German research and a subject index. Price 1s. (post free 1s. 1d.).

**Miss Marjorie Lovell Burgess,** a member of the London District of the Institute of Journalists, gave a lecture-demonstration on "The Gas Industry and the Community" on Dec. 18 to L.C.C. teachers attending a week-end course in visual aids at Glyn House, Ewell, Surrey.





*FOLLOWING experience gained on the several installations of Glover-West vertical retorts at the four works of the Manchester Corporation Gas Department, the staff at the Rochdale Road Works have collaborated with the contractors in producing a new design of top-work. This design has been recently installed on four beds of 50 in. retorts at the Rochdale Road Works, where the large number of varieties of coal makes for very difficult conditions. Results have proved so satisfactory that the fitting of similar type top-work is being undertaken on further beds and also at Partington Works. From these photographs it will be seen that the short gas off-takes, wide, full charge bunkers, and low level collecting main, lead to a spaciousness which provides agreeable working conditions. This improved design operates with the minimum of rodding and cleaning, which keeps the retort stack platforms clean and tidy, and leads to a gratifying increase in thermal yield.*

# IMPROVING THE GAS OUTPUT OF EXISTING PLANTS

## With Particular Reference to Continuous Vertical Retort Installations

By W. S. HUBBARD,

Gas Engineer Liverpool Gas Company

IT would appear that for some years to come gas undertakings will suffer from a shortage of plant, and therefore all existing equipment should be worked to its maximum efficiency. At the same time efforts should be made to improve the outputs of existing plants by attention to repairs and maintenance.

Two main shortages are apparent:

(1) Lack of refractories.
(2) Deficiency of adequate design and drawing office staff.

With regard to the industry's requirements of fabricated iron and steel, the whole country's manufacturing capacity is available, but refractory work is confined to a few specialists.

The Liverpool Gas Company is dealing with an output that has increased from 7,000 mill. cu.ft. of gas in 1939 to 10,000 mill. cu.ft. of gas in 1947, and the only additional basic plant has been a 2¼ mill. per day installation of continuous verticals. The remaining increased output has been achieved by the following:

(1) Replacement of all charging machines on horizontals by De Brouwer type machines providing full charges. This has increased the output of the horizontals by 17%.
(2) At the two larger stations, where water gas plants of 16 mill. per day capacity are available, mechanical producer gas plants have been installed, so that in emergency rich gas up to 600 C.V. can be made on the carburetted water gas plant for dilution by producer gas. It is estimated that up to 10 mill. cu.ft. of producer gas per day can be added when required.
(3) At the Athol Street Works, which consists of an installation of Woodall-Duckham continuous vertical retorts, the maximum output of which was normally regarded as 5.9 mill. per day, modifications in procedure have been made so that it is now regularly producing 6.9 mill. per day.

These notes are written to describe the last-mentioned improvements in the belief that they are of great significance and in the hope that they may be of assistance to others in the industry.

It has been assumed in the past that the continuous vertical retort could provide its own diluent economically by steaming in the retort itself and that a gas of reasonably constant calorific value could be produced with regularity. The work that has been carried out at Liverpool suggests that this supposition requires further examination.

The declared calorific value at Liverpool is 450 B.Th.U. per cu.ft., and even when benzole extraction was fully practised it was found difficult on this particular installation to maintain a good output and at the same time keep the calorific value under control when coals of varying size and quality were being carbonized. When the increase of gas sales persisted at the end of the war and was not followed by a regression, it was decided to make use of a surplus step-grate producer on one of the benches at Athol Street for supplying producer gas that could be added to dilute a richer coal gas, and so provide additional output. Accordingly, a Lymn type gas washer and centrifugal cleaner were installed so that the hot producer gas was cooled and dedusted before admission to the gas mains on the inlet to the main coal gas condensers. The plant consists of two benches of Woodall-Duckham upwardly-heated continuous vertical retorts, each bench containing 30 62 in. retorts. Since 1947 the plant has been on full output with normal scurfing. It is now operated as follows:

(1) The coal throughput per retort is maintained at a maximum consistent with reasonably low volatile therms in the coke.
(2) The steam admitted to the retort is now reduced to a minimum, sufficient only to utilize the sensible heat in the coke for the water gas reaction and to ensure that no over-heating of the bottom casting or seating joists occurs. These modifications obviously aim at the highest calorific value.
(3) When these conditions have been reached they should be maintained as closely as possible, the throughput varying with the type and size of coal. The calorific value of the gas leaving the retort house fluctuates, but is always above the declared value, and no effort is made by alterations on the bench to control it except in extreme emergency.
(4) The calorific value of the gas at inlet to holders is controlled by the admission of diluent producer gas added to the stream on the inlet to exhausters.

The retort benches were originally rebuilt in 1938. At that time the maker's guarantees were as shown in Table A.

These results were only guaranteed when using Yorkshire nuts containing 8% inerts and 34% volatile matter.

TABLE A

| | |
|---|---|
| Calorific value of gas, B.Th.U./cu.ft. ... | 500 |
| Cu.ft. of gas per ton ... ... ... | 15,600 |
| Therms per ton ... ... ... ... | 78 |
| Throughput coal/retort/day, tons ... ... | 6.9 |
| Therms/retort/day ... ... ... ... | 538.2 |
| Cu.ft. gas/retort/day ... ... ... ... | 107,640 |
| Potential daily output (60 retorts) : | |
| Cu.ft. × $10^6$ ... ... ... ... ... | 6.458 |
| Therms ... ... ... ... ... | 32,292 |

The thermal yield per ton was achieved, though the therms per retort per day were not obtained except for short periods. Results obtained for the period 1942-47, which includes a time when some very unsuitable coals were carbonized, are as given in Table B.

TABLE B

| | |
|---|---|
| Calorific value of gas, B.Th.U./cu.ft. ... | 468 |
| Cu.ft. of gas per ton ... ... ... | 17,300 |
| Therms per ton ... ... ... ... | 80.66 |
| Throughput/retort/day ... ... ... | 5.79 |
| Therms/retort/day ... ... ... ... | 467 |
| Cu.ft. gas/retort/day × $10^3$ ... ... ... | 99.8 |
| Potential daily output (60 retorts) : | |
| Cu.ft. × $10^6$ ... ... ... ... ... | 5.988 |
| Therms ... ... ... ... ... | 28,020 |

It should be noted that the throughput of coal and the therms per retort were lower than the guarantee figures. When producer gas was admitted after increasing the coal throughput and making a richer gas in the retort house, diluted to 450, the plant potential was increased.

The actual results, 56 retorts with normal scurfing, are given for a 12-week period, May 2 to July 24, 1948, in Table C.

TABLE C

| | |
|---|---|
| Calorific value of coal gas, B.Th.U./cu.ft. | 497 |
| Cu.ft. of gas per ton ... ... ... | 14,700 |
| Therms per ton ... ... ... ... | 73.27 |
| Throughput/retort/day, tons ... ... | 7.52 |
| Therms/retort/day ... ... ... ... | 551 |
| Cu.ft./retort/day ... ... ... ... | 110,900 |
| Producer gas added per day : | |
| Cu.ft. × $10^6$ ... ... ... ... ... | 0.791 |
| Calorific value ... ... ... ... | 124 |
| Therms ... ... ... ... ... | 982 |
| Total gas per day : | |
| Cu.ft. × $10^6$ ... ... ... ... ... | 6.965 |
| Calorific value ... ... ... ... | 455 |
| Therms ... ... ... ... ... | 31,669 |

TABLE D.—*Potential Daily Output* (60 *retorts*)—i.e., *without scurfing*

| | |
|---|---|
| Coal gas cu.ft. × $10^6$ ... ... ... | 6.653 |
| Producer gas ... ... ... ... ... | 0.852 |
| Total gas at 455 B.Th.U./cu.ft. ... ... | 7.505 |
| Total therms ... ... ... ... ... | 34,150 |
| Total gas at 450 B.Th.U./cu.ft. ... ... | 7.623 |
| Total therms ... ... ... ... ... | 34,304 |

Benzole extraction was carried out to a limited extent during this period to reduce the naphthalene content below 2 gr. per 100 cu.ft. Thus, the increase in potential gas output from the 60 retorts, 56 of which are normally in full operation, is 1.6 mill., and this has been produced at an expenditure on producer gas washing plant of about £1,500. Readers should imagine for themselves the current cost of a vertical retort installation capable of producing 1.6 mill. per day, and should remember the long wait before completion of such a unit. The following points require emphasis:

(1) The thermal output per retort per day has been increased by 11%.
(2) The total daily potential output of the works with 60 retorts in operation has been increased by 25%.
(3) The throughput of coal per retort is 30% greater than hitherto.
(4) The steam admitted to the retorts per ton of coal has been reduced by 20%.
(5) The fuel consumption of the installation has been reduced from 10 lb. of dry coke per 100 tons of wet coal to 9.5 lb. of dry coke per 100 tons of wet coal, and the increased quantity for sale represents an output of 0.6 cwt. of coke and breeze per ton.
(6) The yield of coal gas therms per ton of coal carbonized is reduced by 9.2%, and the combined yield of coal gas and producer gas per ton of coal carbonized reduced by 6.2%.
(7) Combustion chamber temperatures are of the same order as hitherto—namely, about 1,380° C. at the highest point.

A suggested further improvement on our methods is to install an independent purification stream for producer gas so that it could be admitted as near as possible to the Fairweather recording calorimeter in order that the calorific value of the gas going into the holders would be accurately and automatically controlled within very fine limits.

* Note : The author, in his comments on the paper by Mr. T. C. Finlayson and Mr. F. S. Townend at the June meeting of the Institution of Gas Engineers, promised the information in this article.

# COKE FINES AS BOILER FUEL

## THE "OLDBURY" STOKER

THE National Technical Committee of the Federation of Coke Associations recently held a joint meeting at Coventry with the Midland Technical Committee. An interesting morning was spent inspecting the "Oldbury" chain grate stokers at Foleshill Gas-works which are successfully using coke fines as the boiler fuel. After a luncheon attended by both Committees, members of the Coventry Gas Committee, and Mr. J. E. Wakeford, the Engineer and Manager, the Joint Committees held their business meeting at the Coventry gas undertaking's showroom under the Chairmanship of Mr. W. K. Hutchison.

The "Oldbury" chain grate stoker is produced by Edwin Danks & Co. (Oldbury), Ltd., and was described and illustrated in the "JOURNAL" of Feb. 25, 1948. It follows conventional design in that the grate surface consists essentially of an endless chain of short cast iron links, linked together by rods and driven by sprockets mounted on a shaft at the front of the stoker. The chain is supported on an all-welded air box which forms the chassis and is made in one piece. The links, which are self-cleaning, have very fine air spaces which enables fine fuels, such as coke breeze to be burned with a minimum of riddlings. The continuous drive is provided by a D.C. variable speed motor with built-in controller. Ignition of coke breeze is facilitated by a patented system of recirculation. Ports are cast into the refractory filled firedoor which operates into a box closed at the top. This box is normally supplied with air under pressure, which is used as secondary air when burning coal. To provide recirculation a small duct is connected between the top of the box and the side flue of the boiler. The secondary air is shut off and a slight suction is produced which induces hot gases to flow over the incoming coke and up through the ports in the firedoor. These hot gases promote ignition and also achieve a certain amount of pre-drying of the breeze which is in contact with the hopper side of the door. Air is supplied by a forced draught fan and has independent control to each grate. The air supply to the front and rear of each grate can also be controlled by dampers. The stoker can be withdrawn from the flue for inspection in about an hour using the trolleys supplied by the makers.

The following tests were submitted to the Technical Committees, No. 1 being made on small screened No. 4 coke nuts $\frac{7}{16}$ in.-$\frac{1}{4}$ in., and No. 2 using unscreened coke fines $\frac{7}{16}$ in.-0 in.

### *No. 1 Test, Coventry Gas Department*

Report of test of No. 4 coke nuts on Lancashire boiler, fitted with "Oldbury" chain grate stokers :

1. *Boiler:* Lancashire, 30 ft. by 8 ft.
2. *Stokers:* Two of 20 sq. ft. each, total grate area 40 sq. ft. Forced draught and chimney draught employed. Average fuel bed 5 in.; average speed No. 3. All ash plates unhooked from ends of grates.
3. *Test:* Seven days, May 5-May 12, 1948.
4. *Readings:* Taken every six hours throughout test. Total 29.
5. *Fuel:* No. 4 coke nuts $\frac{7}{16}$ in.-$\frac{1}{4}$ in. round holes.
   (*a*) Analysis— Moisture, 10.0%. Volatile M., 1.5%. Fixed carbon, 75.3%. Ash, 13.2%. Calorific value, 10,930 B.Th.U./lb. wet. Calorific value, 12,140 B.Th.U./lb. dry.
   (*b*) Screening—Over $\frac{1}{4}$ in., 63.4%. Below $\frac{1}{4}$ in., 36.6%.
   (*c*) Quantity used, 162,512 lb. = 967 lb./hr.
   (*d*) Fuel per hour per sq. ft. of grate = 24.2 lb.
6. *Ashes:*
   (*a*) Weight collected 26,096 lb.
   (*b*) Percentage of fuel, 16.1.
   (*c*) Riddlings, 11,091 lb. through $\frac{1}{4}$ in. = 42.5% of ashes.
   (*d*) Analysis—

| | Ashes | Riddlings |
|---|---|---|
| Moisture | 0.2% | 0.3% |
| Combustible matter | 42.0% | 28.2% |
| Ash | 57.8% | 71.5% |

7. *Water:*

| | |
|---|---|
| To boiler | = 909,000 lb. |
| Blow down | = 23,730 lb. |
| Evaporated | = 885,270 lb. |
| | = 5,270 lb./hr. |
| Evaporation per lb. fuel | = 5.44 lb. |
| Temperature inlet econ. | = 63° F. |
| Temperature outlet econ. | = 155° F. |

8. *Steam:*

| | |
|---|---|
| Gauge pressure | = 93 lb./sq. in. |
| Final temperature | = 640° F. |

9. *Flue gases:*

| | $CO_2$ | Temperature |
|---|---|---|
| Left-hand flue | 11.8% | 685° F. |
| Right-hand flue | 10.9% | 705° F. |
| Main flue | — % | 505° F. |

10. *Draught:*

| | |
|---|---|
| Fan supply | 2.6 in. W.G. |
| Left-hand grate | 0.7 in. W.G. |
| Right-hand grate | 0.7 in. W.G. |
| Fuel beds | 3/100 in. W.G. |
| Left-hand damper | 13 in. open |
| Right-hand damper | 14 in. open |

11. *Results:*

| | |
|---|---|
| (*a*) Boiler output | = 5,270 lb./hr. |
| (*b*) Ashes made | = 16.1% of fuel |
| (*c*) Steam generated | = 5.44 lb. per lb. of fuel |
| (*d*) Boiler deficiency | = 61.6% |

12. *Heat Balance (on net calorific value of fuel):*

| | |
|---|---|
| (*a*) Overall efficiency of boiler | = 61.6% |
| (*b*) Loss in flue gases | = 21.8% |
| (*c*) Loss in ashes | = 7.8% |
| (*d*) Radiation losses and unaccounted-for | = 8.8% |
| | 100.0% |

### *No. 2 Test, Coventry Gas Department*

Report of test of fine coke breeze on Lancashire boiler, fitted with "Oldbury" chain grate stokers:

1. *Boiler:* Lancashire, 30 ft. by 8 ft.
2. *Stokers:* Two of 20 sq. ft. each; total grate area 40 sq. ft. Forced draught and chimney draught employed. Average fuel bed 5½ in.; average speed No. 3. All ash plates unhooked from ends of grates.
3. *Test:* Seven days, May 26-June 2, 1948.
4. *Readings:* Taken every six hours throughout test, total 29.
5. *Fuel:* Fine coke breeze $\frac{7}{16}$ in.-0 in. round holes.
   (*a*) Analysis—Moisture, 12.3%. Volatile M., 2.7%. Fixed carbon, 70.5%. Ash, 14.5%. Calorific value, 10,520 B.Th.U./lb. wet. Calorific value, 11,990 B.Th.U./lb. dry.
   (*b*) Screening—Over $\frac{1}{4}$ in., 9.4%. $\frac{1}{4}$ in.-$\frac{1}{8}$ in., 34.4%. $\frac{1}{8}$ in.-$\frac{1}{16}$ in., 25.0%. $\frac{1}{16}$ in.-0 in., 31.2%.
   (*c*) Quantity used, 197,008 lb. = 1,173 lb./hr.
   (*d*) Fuel fired per sq. ft. of grate, 29.3 lb./hr.
6. *Ashes:*
   (*a*) Weight collected, 38,528 lb.
   (*b*) Percentage on fuel, 19.5.
   (*c*) Riddlings, 23,887 lb. through $\frac{1}{4}$ in. = 42.5% of ashes.
   (*d*) Analysis—

| | Ashes | Riddlings |
|---|---|---|
| Moisture | 3.8% | 4.7% |
| Combustibles | 35.2% | 59.4% |
| Ash | 61.0% | 35.9% |

7. *Water:*

| | |
|---|---|
| To boiler | = 985,500 lb. |
| Blow down | = 23,730 lb. |
| Evaporated | = 961,770 lb. |
| | = 5,725 lb./hr. |
| Evaporation per lb. fuel | = 4.87 |
| Temperature inlet econ. | = 57° F. |
| Temperature outlet econ. | = 152° F. |

8. *Steam:*

| | |
|---|---|
| Gauge pressure | = 90 lb. sq. in. |
| Final temperature | = 634° F. |

9. *Flue gases:*

| | $CO_2$ | Temperature |
|---|---|---|
| Left-hand flue | 13.5% | 717° F. |
| Right-hand flue | 13.3% | 737° F. |
| Main flue | — % | 391° F. |

10. *Draught:*

| | |
|---|---|
| Fan supply | 2.4 in. W.G. |
| Left-hand grate | 1.0 in. W.G. |
| Right-hand grate | 1.0 in. W.G. |
| Fuel beds | 3/100 in. W.G. |
| Left-hand damper | 14 in. open |
| Right-hand damper | 16 in. open |

11. *Results:*

| | |
|---|---|
| (*a*) Boiler output | = 5,725 lb./hr. |
| (*b*) Ashes made | = 19.5% of fuel |
| (*c*) Steam generated | = 4.87 lb. per lb. of fuel |
| (*d*) Boiler efficiency | = 57.5% |

12. *Heat balance (on net calorific value of fuel):*

| | |
|---|---|
| (*a*) Overall efficiency of boiler | = 57.5% |
| (*b*) Loss in flue gases | = 19.4% |
| (*c*) Loss in ashes | = 10.2% |
| (*d*) Radiation losses and unaccounted for | = 12.9% |
| | 100.0% |

# WORLD DEMAND FOR SULPHATE OF AMMONIA

## WORK OF THE BRITISH FEDERATION

THE twenty-eighth annual report of the British Sulphate of Ammonia Federation for the year ended June 30, 1948—the 51st year of propaganda work undertaken successively by the Sulphate of Ammonia Committee, the Association, the Federation, Nitram, Ltd., and Imperial Chemical Industries, Ltd.—records that the world demand for fertilizer nitrogen is still greatly in excess of the supply available. The International Emergency Food Committee in Washington continues to be responsible for apportioning supplies between consuming countries except for the U.S.S.R. and some neighbouring States.

The following estimates which are expressed in thousands of metric tons of pure nitrogen for "fertilizer years" ended June 30, are based on the published information available. The estimates for 1946-47 and 1938-39 have been slightly revised. No figures are included for U.S.S.R. for any year, nor for the North Korea and Manchuria for 1946-47 and 1947-48—the figures for these territories in 1938-39 being included under "Other Asia."

*Production and Consumption*

| | 1947-48 | | 1946-47 | | 1938-39 | |
|---|---|---|---|---|---|---|
| | Production | Consumption | Production | Consumption | Production | Consumption |
| Europe* ... ... | 1,508.1 | 1,571.3 | 1,205.1 | 1,316.6 | 1,833.2 | 1,709.7 |
| Belgium - Luxemburg ... ... | 155.6 | 89.1 | 127.0 | 90.0 | 95.0 | 68.1 |
| France ... ... | 176.4 | 232.8 | 148.1 | 192.9 | 167.5 | 201.8 |
| Netherlands ... | 78.1 | 118.0 | 58.5 | 107.6 | 106.3 | 97.2 |
| Norway ... ... | 88.4 | 23.6 | 97.5 | 23.5 | 97.7 | 12.8 |
| United Kingdom | 321.6 | 243.0 | 297.6 | 217.1 | 171.0 | 98.0 |
| Other Europe* ... | 688.0 | 864.8 | 476.4 | 685.5 | 1,195.7 | 1,231.8 |
| Asia ... ... ... | 238.7 | 510.4 | 198.6 | 359.7 | 525.5 | 631.7 |
| China and Formosa ... ... | 8.2 | 47.5 | 4.9 | 34.7 | 1.2 | 72.2 |
| India and Pakistan ... ... | 8.6 | 46.7 | 6.1 | 39.6 | 4.3 | 21.9 |
| Ceylon ... ... | — | 10.2 | — | 8.4 | — | 8.4 |
| Japan proper ... | 221.4 | 325.1 | 187.0 | 220.0 | 338.0 | 356.6 |
| Other Asia ... | 0.5 | 80.9 | 0.6 | 57.0 | 182.0 | 172.6 |
| Africa ... ... | 17.3 | 107.1 | 17.8 | 85.8 | 9.7 | 106.1 |
| Egypt ... ... | 0.2 | 66.4 | 0.2 | 50.2 | 0.2 | 77.8 |
| Other Africa ... | 17.1 | 40.7 | 17.6 | 35.6 | 9.5 | 28.3 |
| Oceania ... ... | 9.1 | 16.8 | 7.0 | 17.0 | 5.3 | 18.2 |
| America ... ... | 1,559.6 | 1,152.4 | 1,386.0 | 1,032.4 | 590.4 | 492.4 |
| U.S.A.† ... ... | 1,094.0 | 1,040.2 | 941.4 | 945.4 | 303.6 | 443.3 |
| Canada ... ... | 182.9 | 39.9 | 186.3 | 35.1 | 61.0 | 16.9 |
| Chile ... ... | 280.6 | 10.7 | 256.4 | 11.0 | 225.4 | 5.8 |
| British West Indies | — | 5.7 | — | 5.1 | — | 4.6 |
| Other American ... | 2.1 | 55.9 | 1.9 | 35.8 | 0.4 | 21.8 |
| World total ... | 3,332.8 | 3,358.0 | 2,814.5 | 2,811.5 | 2,964.1 | 2,958.1 |

* Including Russ an Zone of Germany. † Including Hawaii and Puerto Rico.

### Home Production

The figures in the following table show that the total home production of ammonia products in 1947 was about 7% less than in 1946. Fertilizer products decreased by just under 7% and industrial products fell by about 13%. These declines are due to the fuel shortage in the early months of 1947.

*Production of Ammonia Products and of Ammonium Sulphate in the British Isles*

(Tons of 2,240 lb.)

| Calendar year | Ammonia products, basis 25% ammonia (about 20.6% nitrogen) | Included in the total | |
|---|---|---|---|
| | Gt. Britain and Ireland | Industrial ammonia products (basis 25% ammonia) | Sulphate of ammonia as such (actual tons of product) |
| | | About | About |
| 1913 ... ... | 423,900 | 66,000 | 365,000 |
| 1918 ... ... | 423,900 | 173,000 | 258,000 |
| 1923 ... ... | 441,200 | 45,500 | 391,500 |
| 1933 ... ... | 693,000 | 88,500 | 580,700 |
| 1939 ... ... | 772,500 | 182,700 | 483,300 |
| 1944 ... ... | 1,429,200 | 154,700 | 779,500 |
| 1945 ... ... | 1,375,600 | 159,900 | 760,400 |
| 1946 ... ... | 1,430,000 | 152,500 | 833,700 |
| 1947 ... ... | 1,325,700 | 132,500 | 796,700 |

The nitrogen content of the sulphate of ammonia averaged 20% in the earlier years and 21% from 1933 onwards.

During the year Ministerial and other statements have emphasized the necessity of increasing agricultural output in the United Kingdom and the official five-year plan which aims at an increase of 20% is well under way. Emphasis has been laid on the great increase in output of livestock products which can be achieved by the correct use of fertilizers and special attention has again been devoted to grassland.

It has been shown that the full benefit of the use of sulphate of ammonia and other fertilizers on grassland can only be obtained in conjunction with sound management of grazing and conservation by the processes of silage and drying. Both of these processes have made considerable progress during the year. In the last report reference was made to collaboration with the Milk Marketing Board in an experiment in co-operative grass-drying. This experiment was sufficiently promising for an extension to be made in 1948, and 10 co-operative drying centres have been brought into operation by the Milk Marketing Board. The initial experiment also stimulated activity in contract drying by farmers' co-operative organizations, and several centres have been established on a commercial basis.

### New Developments in Technique

The reviving interest in silage making and the significant increase in production of stock food by this means have been mainly due to two factors—new developments in technique and improved mechanical equipment, in both of which Imperial Chemical Industries, Ltd., have played a leading part. The adoption of pit and clamp silos in place of the relatively expensive concrete containers has made it possible to use the tractor for consolidating the grass and thus save manual labour.

As a result of these grassland developments and a further expansion in the use of fertilizers on arable crops, nitrogen consumption during the year was the highest ever achieved in this country.

The increased use of compound fertilizers on arable crops has had a marked effect on the distribution of sulphate of ammonia. The tendency to increase the nitrogen content of compound fertilizers has been mentioned from time to time in previous reports as one of the reasons for the expansion in the use of sulphate of ammonia. In 1938-39 Federation sales to compound fertilizer manufacturers were 82,000 tons; in 1947-48 they were 333,600 tons. The nitrogen content of compounds has remained steady during the last few years and the record figure of sales of sulphate of ammonia to manufacturers during the year under review is due to the expansion in compound fertilizer manufacture. The fertilizer manufacturers have broken all previous records with a production of over 1½ mill. tons of compounds during the year. These results in the first year of the Government's agricultural expansion programme indicate that the demand for sulphate of ammonia in the home market will continue to expand.

### Propaganda

While propaganda continues to give due weight to all sound methods of increasing efficiency in agriculture, including the proper use of sulphate of ammonia, the emphasis during the year has been on grassland, the increased output of grass and its proper utilization being the major theme. Although paper restrictions have continued, a series of educational booklets were issued, two of which were specifically devoted to the use of sulphate of ammonia.

During the year the agricultural staff of I.C.I. gave a number of lectures to merchants, farmers, and others with the aid of still and moving films. Looking to the future they are also increasing the number of lectures to young farmers' clubs and youth organizations.

Statistics relating to home agricultural consumption in the British Isles are as follows:

| Fertilizer year | Sulphate of ammonia Tons of 2,240 lb. Total | Sulphate of ammonia 20.6% N. | Nitrogen Metric tons N. Nitrogen in other forms | Total nitrogen |
|---|---|---|---|---|
| 1913-14 ... | 60,000 | 12,558 | 12,598 | 25,156 |
| 1918-19 ... | 269,000 | 56,301 | 3,937 | 60,238 |
| 1923-24 ... | 142,400 | 29,804 | 7,874 | 37,678 |
| 1930-31 ... | 164,200 | 34,366 | 10,570 | 44,936 |
| 1938-39 ... | 215,537 | 45,111 | 23,537 | 68,648 |
| 1943-44 ... | 665,280 | 139,240 | 43,692 | 182,932 |
| 1945-46 ... | 554,793 | 116,116 | 50,308 | 166,424 |
| 1946-47 ... | 556,063 | 116,382 | 50,616 | 166,998 |
| 1947-48 ... | 661,500 | 138,450 | 52,950 | 191,400 |

Total shipments of sulphate of ammonia from the United Kingdom for the past five years were: 1943-44, 60,683 tons; 1944-45, 206,450 tons; 1945-46, 274,589 tons; 1946-47, 247,801 tons; 1947-48, 240,598 tons.

During 1947-48 the Board of Trade, in collaboration with the International Emergency Food Committee, continued to allocate tonnages of British sulphate to be shipped to overseas markets.

The Research Department has continued to deal with members' individual manufacturing problems. In addition there have been regular meetings with members' technical representatives. Special attention is being given to materials of construction with a view to reducing maintenance costs. Experiments on a wide range of materials are in progress. Laboratory work aiming at improved methods of operational control is also proceeding.

# COMMERCIAL AND INDUSTRIAL UTILIZATION OF GAS—NO. 2

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## 1. Principles of Combustion ; Characteristics of Various Fuels ; Flue Gases

### (a) PRINCIPLES OF COMBUSTION

COMBUSTION is the chemical union of an inflammable substance with oxygen in definite proportions which are always the same, causing the liberation of a definite quantity of heat independent of the time occupied. To produce combustion it is necessary to bring the oxygen and inflammable substance to "kindling or ignition temperature," and for combustion to be continued it is necessary to maintain this kindling temperature during the entire period of oxidation. This may be termed rapid oxidation in contradistinction to slow oxidation, such as the rusting of exposed steel structures. The opposite process is called "reduction," and consists of the removal of oxygen from materials, such as in the smelting of oxide ores. Some materials are incombustible, for, being completely oxidized, they are incapable of any further union with oxygen—*i.e.*, various stones, brick, carbon dioxide, and water. Spontaneous combustion is caused by the heat developed in materials through slow oxidation without opportunity for its being dissipated, due to the poor conductivity of the outside covering of material, until a point is reached where ignition takes place and the material bursts into flames. Thus, for a given set of final products the total heat liberated is the same whether oxidation is slow or rapid, so that considerable increases in temperature can easily occur, or be produced, under suitable conditions.

All fuels are generally composed of three combustible elements —carbon, hydrogen, and sulphur. Coal is principally carbon, while natural gas is composed of carbon and hydrogen, but in the combined state chiefly the gas called methane ($CH_4$). Carbon and hydrogen are the elements ordinarily considered as the heat-producing combustibles, for sulphur is generally present in so small a quantity as to be deemed a negligible combustible factor. The source of oxygen for most combustion is from the air, which is a mechanical mixture of oxygen, nitrogen, water vapour, a small amount of carbon dioxide, and minute amounts of inerts which do not behave differently from nitrogen. In combustion calculations the small amount of carbon dioxide in the air is included with the nitrogen, and the average value of the proportions of oxygen to nitrogen are as follows:—

| | Percentage by volume | Percentage by weight |
|---|---|---|
| $O_2$ ... ... ... | 20.91 | 23.11 |
| $N_2$ ... ... | 79.09 | 76.89 |

Oxygen is the material which enters into chemical combination with the available combustible material after being brought to kindling temperature, but nitrogen only serves as a diluent, and is a direct loss so far as ultimate flame temperature is concerned. This property is actually valuable as, if it were not for the cooling effect of the nitrogen, combustion would take place with tremendous violence.

The volume of water vapour present in a gaseous mixture is of some importance in accurate calculations although disregarded in most computations. For example, the gross heating value of dry methane is given at 1,023 B.Th.U/cu.ft., but the presence of, say, 1.73% of water vapour at 60°F would reduce this to 1,005 B.Th.U/cu.ft. The incidence of water vapour in the initial gas and/or air prior to mixing before combustion, and the fact that all fuels containing hydrogen will in any case produce water vapour on combustion, create the Gross and Net heating values of these fuels. This latent heat of vaporization, needed for the conversion of water to steam or liberated on the condensation of steam to water, only becomes available for heating purposes when the flue products are cooled to such a temperature that the water actually condenses. In effect this means back to the starting temperature, and even then there is some loss because the flue gases will still be saturated while the entering air may be quite dry. This loss is allowed for in calorimetric determinations which are made to give the Gross heating value.

Taking an actual case, assume a specific type of coal gas which for perfect combustion produces 1.208 cu.ft. of $H_2O$ vapour in a total volume of 5.702 cu.ft. of flue products. The partial pressure of water vapour is 0.212 atmospheres, or 6.34 Hg. From steam tables the saturation temperature corresponding to this partial pressure is 143°F. Therefore, none of the latent heat becomes available until the flue products are cooled below this point. At 117°F the vapour pressure is 3.16 Hg., so that about one-half of the water vapour would have condensed, and its latent heat would have been made available. Excess air reduces the vapour pressure. Therefore, if the volume of products had been doubled by excess air, the saturation point would have been lowered to the extent that condensation would not have commenced before 117°F. If enough excess air is added, condensation will not begin even by the time products have been cooled to 60°F. This is confirmed by the fact that, except in the case of some water heaters, hot water house heating boilers, and one or two other appliances, no condensation occurs; and even with heating boilers this can be avoided by carrying the hot flue products into the centre of an upward moving stream of excess air, without mechanical resistance, so venting the water vapour to atmosphere before it has fallen in temperature to condensing point.

The actual heat loss with perfect combustion of a gas depends upon the above water vapour concentration, represented by the cubic feet of water vapour in the resultant flue products, which amount varies with the constituents of differing gases and is usually of the order of 8-10% of the gross heating value. Thus a gas of 475 B.Th.U per cu.ft. gross value would probably be about 430 B.Th.U net value. As the flue gas temperatures of gas furnaces are normally much higher than the saturation or dew-point temperature at which condensation would commence, the gross value is used for calculating furnace efficiencies. The net value is the one used when calculating heat balances, flame temperatures, &c. The particular value used should always be indicated.

### (b) CHARACTERISTICS OF VARIOUS FUELS

Some idea of the heating value of various industrial fuels is given in the following table:—

Lower Heat Values in B.Th.U./lb. of Commercial Fuels

| | B.Th.U. |
|---|---|
| Alcohol, industrial ... ... ... ... | 10,000 |
| Bagasse (crushed sugar cane) 50% moist... | 2,500 |
| Charcoal ... ... ... ... | 13,500 |
| Coal : | |
| Anthracite, Welsh ... ... ... ... | 15,000 |
| Colliery belt pickings ... ... ... | 7,500 |
| Colliery washery refuse ... ... ... | 5,200 |
| Navigation, Welsh... ... ... ... | 14,500 |
| Navigation, Northern ... ... ... | 13,500 |
| Steam, average ... ... ... ... | 12,500 |
| Coke, 0.85 fixed C., 7% moist ... ... | 11,600 |
| Lignite, 30% moist ... ... ... ... | 7,500 |
| Oils : | |
| Benzol ... ... ... ... ... | 17,300 |
| Fuel oils ... ... ... ... ... | 18,000 |
| Paraffin (kerosene)... ... ... ... | 18,000 |
| Petrol ... ... ... ... ... | 18,500 |
| Tar oil ... ... ... ... ... | 15,500 |
| Peat, 35% moist ... ... ... ... | 5,700 |
| Pitch ... ... ... ... ... ... | 15,500 |
| Tar ... ... ... ... ... ... | 15,500 |
| Wood : | |
| Air dried ... ... ... ... ... | 6,000 |
| Green—about ... ... ... ... | 4,500 |
| Refuse, dry... ... ... ... ... | 5,500 |
| Carbon : | |
| To $CO_2$ ... ... ... ... ... | 14,550 |
| To CO ... ... ... ... ... | 4,400 |

The usual solid fuel competition is from coal, coke, and powdered fuel with comparatively straightforward and limited analyses. As there may be competition from a wider range of liquid and gaseous fuels the following information should be useful. Gross heating values are used.

| Fuel oils | Sp. gr. | Viscosity | B.Th.U./lb. |
|---|---|---|---|
| Gas oil ... ... ... ... | 0.83-0.85 | 35 | 19,600 |
| Diesel-domestic oil ... ... ... | 0.86-0.88 | 40 | 19,350 |
| Light fuel oil (normal) ... ... | 0.90-0.91 | 70 | 19,200 |
| Heavy fuel oil (normal) ... ... | 0.92-0.93 | 200 | 18,900 |
| Light fuel oil (C/P) ... ... ... | 0.93 | 200 | 18,800 |
| Heavy fuel oil (C/P) ... ... | 0.96 | 950 | 18,500 |
| Coal tar fuels... ... ... ... | 1.10 | 50-400 | 16,000-17,000 |

The viscosity figures are Redwood No. 1, and represent the time taken in seconds for 50 c.c. of oil heated to 100°F to flow through an orifice of known diameter and length in the base of a standard Redwood Viscometer. The amount of air required for the combustion of 1 lb. of fuel oil is about 180 cu.ft.

| Gaseous fuels | B.Th.U./ cu.ft. | Theo. air cu.ft. |
|---|---|---|
| Blast furnace gas ... ... ... ... | 110 | 0.75 |
| Producer gas : | | |
| Coal ... ... ... ... ... | 120 | 1.05 |
| Anthracite ... ... ... ... | 133 | 1.09 |
| Built-in, coal ... ... ... ... | 145 | 1.09 |
| Blue water gas, coke ... ... ... | 290 | 2.26 |
| Town gas ... ... ... ... ... | 425-560 | 3.5-4.5 |
| Coke oven gas ... ... ... ... | 500-520 | 4.0-4.2 |

Carburetted water gas is obtained by carburetting fuel oil into blue water gas at the approximate rate of one gallon per 100 B.Th.U lift in calorific value per 1,000 cu.ft. of gas.

The figures quoted are general ones which can vary in fuel oils with their source of origin—*i.e.*, asphalt, paraffin, or naphthalene base—while gas compositions can vary with the types of coal used and the carbonizing process employed. It will, however, be of interest to study some typical analyses of gaseous fuels, and these are given below, as follows:—

(1) Coal Gas, Producer Gas, and Water Gas (% by volume)

| Constituent | L.T. | Coal gas: Horizontal retort | Coal gas: Continuous vertical retort (steaming) | Producer gas: Coal | Producer gas: Blue | Water gas: Carburetted |
|---|---|---|---|---|---|---|
| $O_2$ | 0.5 | 0.4 | 0.4 | — | — | 0.4 |
| $CO_2$ | 4.0 | 2.0 | 4.0 | 4.0 | 4.7 | 5.6 |
| Cn Hm | 5.5 | 3.6 | 2.0 | 0.4 | — | 7.0 |
| CO | 4.0 | 8.0 | 18.0 | 29.0 | 41.0 | 30.5 |
| $H_2$ | 30.0 | 52.0 | 49.4 | 12.0 | 49.0 | 37.5 |
| $CH_4$ | 52.0 | 30.0 | 20.0 | 2.6 | 0.8 | 14.0 |
| $N_2$ | 4.0 | 4.0 | 6.2 | 52.0 | 4.5 | 5.5 |
| Gross calorific value at N.T.P. (saturated) in B.Tn.U./cu.ft. | 889 | 560 | 475 | 163 | 295 | 500 |

(2) Town Gas (% by volume)

| Constituent | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| $O_2$ | 1.0 | 0.3 | 0.5 | 0.8 | 0.7 | 0.5 | 0.5 |
| $CO_2$ | 2.3 | 4.3 | 3.2 | 2.5 | 3.2 | 3.1 | 3.4 |
| Cn Hm | 2.9 | 2.0 | 2.0 | 3.5 | 4.3 | 4.1 | 5.6 |
| CO | 11.6 | 28.3 | 19.0 | 15.0 | 12.0 | 11.0 | 16.5 |
| $H_2$ | 47.6 | 37.3 | 48.3 | 48.0 | 46.2 | 49.1 | 39.2 |
| $CH_4$ | 21.0 | 23.0 | 19.0 | 22.0 | 23.3 | 24.5 | 24.3 |
| $N_2$ | 13.6 | 4.7 | 8.0 | 8.2 | 10.3 | 7.7 | 10.5 |
| Gross calorific value at N.T.P. (saturated) in B.Tn.U./cu.ft. : | 475 | 498 | 449 | 501 | 517 | 530 | 548 |

The variation in the percentage of combustibles (CnHm. CO, $H_2$, and $CH_4$), and the inerts ($CO_2$ and $N_2$) should be noted. The sulphur contents of fuels are so small that although the heat value is high the heat liberated is a negligible addition to the total heat per unit of fuel. In town gas the amount varies from 3-6 grs. to over 20 grs. per 100 cu.ft., but is usually between 10-20 grs.

(c) PRODUCTS OF COMBUSTION.

Having outlined the principles of combustion, and given an indication of the characteristics of a number of representative fuels, the picture must be rounded off by reference to the products of combustion, as these are a common denominator of all fuels and the criterion of the practical efficiency of combustion. Two types of efficiency are necessary to ensure the utmost total furnace efficiency, first to burn the fuel in the best practical manner, and secondly to apply the liberated heat to the greatest effect; in other words, to obtain the greatest production for the minimum amount of fuel. Furnace design and heat applications will be discussed later. In respect of combustion there are, fortunately, several comparatively simple methods of obtaining precise information regarding the use or mis-use of the fuel. The amount of oxygen required for any fuel can be calculated from the fuel analyses, the flue-gas constituents can also be calculated, and the actual flue products can be checked by means of the Orsat apparatus. For example, the results obtained from No. 1 Town Gas would be as follows:—

Air Requirements

| | | | |
|---|---|---|---|
| $CH_4$ | $= 0.21 \times 2$ | $= 0.420$ | |
| Cn Hm | $= 0.029 \times 4.5$ | $= 0.131$ | |
| CO | $= 0.116 \times \frac{1}{2}$ | $= 0.058$ | Air necessary |
| $H_2$ | $= 0.476 \times \frac{1}{2}$ | $= 0.238$ | $= 0.837 \times \frac{100}{0.209}$ |
| | | 0.847 | |
| Less $O_2$ present | | $= 0.010$ | $= 4.0$ volumes per cu.ft. |
| $O_2$ to be supplied | | $= 0.837$ | gas burned |

Products of Combustion

| | $CO_2$ | $H_2O$ | $N_2$ |
|---|---|---|---|
| From $CH_4$ | 0.210 | 0.420 | — |
| Cn Hm | 0.015 | 0.015 | — |
| CO | 0.116 | — | — |
| $H_2$ | — | 0.476 | — |
| Present in gas | 0.023 | — | 0.136 |
| From air (4.0-0.837) | — | — | 3.163 |
| | 0.364 | 0.911 | 3.299 |

Thus for every cubic foot of gas burned there will be 0.364 cu.ft. $CO_2$, plus 0.911 cu.ft. $H_2O$, and 3.299 cu.ft. $N_2$, or 4.574 cu.ft. products, all at N.T.P. Of the total volume of 4.574 cu.ft., the $H_2O$ disappears leaving 3.663 cu.ft. containing 0.364 cu.ft. $CO_2$, or 10.06% $CO_2$ for this particular gas analysis.

With this information available it is then necessary to ascertain with the Orsat apparatus that the flue gas analysis is as near to perfect combustion as practicable—*i.e.*, say $CO_2$ 10.0%, $O_2$ 0.5%, and CO nil. The slight variation from a perfect analysis is to prevent the presence of CO in the flue gases, as the incidence of each 1.0% CO in high temperature flue gases is considered to represent some 7.0% drop in final combustion efficiency.

It is rather a laborious task to estimate the constituents of products of combustion on each occasion, and a useful graph can be prepared to give the approximate heat in flue products for various $CO_2$ analyses from 7-12% and the available heat value in the gas from 200-500 B.Th.U./cu.ft. gross, over a range of furnace temperatures. With this, one can see at a glance the amount of heat lost in the flue gases, and conversely, the amount of heat available for heating the stock in the furnace, giving a broad indication of the overall efficiency of the furnace.

To conclude the information on flue gases it is of interest to note that the approximate times for their retention in normal furnaces operated under slight positive pressure is estimated to be of the following order: at 1,000°C. 5 secs., at 1,250°C. 3 secs., and at 1,350°C. 1½ secs. As these hot gases are normally at about 100°C. above the furnace working temperature it is obviously good practice to retard their flow through the furnace as much as is practically possible to assist the maximum heat liberation before the gases are vented to atmosphere. This is done by checking the damper, or dampers, until there is a slight positive furnace pressure, which also precludes the ingress of cold air, thus minimizing scaling of ferrous work, local black spots, and the demand for additional heat input to balance this cold air. The normal velocity of hot gases through flue ports is about 40 ft. per sec., and allowances for quick assessment of flue areas are 1 sq. in. of flue area per 20-25 cu.ft. of gas burned/hour with natural-draught burners, and 50-60 cu.ft./hour with air-blast or pressure burners.

For practical confirmation of the above let us take the case of a normal oven or forge type furnace 3 ft. 6 in. wide × 3 ft. 6 in. deep with an average height of 1 ft. 6 in. The volume of this working chamber would be 18.375 cu.ft., so that at 1,000°C. with a maximum gas rate of 1,500 cu.ft. per hour the volume of hot gases would be as follows.—

(Air + Gas) × Expansion ratio.

$$= \frac{(6{,}000+1{,}500)}{1} \times \frac{(1{,}832+460)}{60+460} = 7{,}500 \times 4.4 = 33{,}000 \text{ cu.ft./hr.}$$

The volume/sec. = 9.17 cu.ft., ∴ time in furnace = 2 secs.

The equivalents for 1,250°C. and 1,350°C would be approximately 1 sec. and ⅝ sec. This appears to be much less than the general figures given above, which are probably achieved by the combination of several factors such as operating at less than the maximum burner capacity rating, high convection currents, and positive furnace pressure. For the same furnace volume and pressure conditions at higher gas rates to meet higher temperatures the times of retention must necessarily be reduced.

For the same furnace and gas rate the flue area would be $\frac{1{,}500}{50}$ = 30 sq. in. Using the formula $Q = AV$ with "V" at 40 ft./sec., the equation would be $Q = \frac{30}{144} \times \frac{40}{1} = 8.33$ cu.ft./sec. As the actual maximum quantity of hot gases to be vented is 9.17 cu.ft./sec., and at 50 ft./sec. the flues could pass 10.42 cu.ft./sec., it will be seen that the empirical calculation for air-blast burners is reasonably sound. Being related to the rate of gas consumption the flue proportions are maintained at all stages, even with natural draught burners which are sensitive to pressure build-up at their outlets.

## 2. Types of Burners and Air/Gas Mixing Equipment

Before describing the above equipment it is necessary to eradicate the fallacious idea that the incidence of mixing oxygen (air) with gas prior to ignition liberates a greater quantity of heat from a unit of fuel. The amount of heat produced by the complete combustion of a cubic foot of town gas depends solely upon the calorific value of the gas. If a cubic foot of 500 C.V. gas is completely burned, a definite quantity of heat—500 B.Th.U.—is evolved, provided complete condensation takes place. The degree of aeration does, however, affect the size and the temperature of the flame. Most parts of an aerated flame are hotter than a luminous flame, but at equal gas rates the luminous flame is larger. Thus, a bunsen flame is sharper and hotter than a luminous "neat gas" flame, but at equal gas rates the amount of heat liberated is the same. This is developed in air-blast and pressure gas burners, and similarly in the extreme case of comparing the heat liberated by the oxidation of exposed steelwork and the equivalent heat liberated by an oxycoal gas flame. The fundamental reasons for the development of the different types of burner application are the necessity of obtaining higher flame temperatures to give a temperature "head" above the furnace working temperatures required and to liberate more heat into a known working space in a limited time, in order to obtain greater production at higher temperatures in a shorter time than could be obtained by the use of the simpler types of burners with their limitations.

There are so many types of proprietary burners and air/gas mixing equipments on the market that it is only possible to describe them in principle, and the following appears to be a reasonably comprehensive range:—

1. Jets—luminous and aerated.
2. Injectors—low and high pressure.
3. Separate air/gas entrances into combustion chambers.
4. Nozzle mixing.
5. Flame-retaining burners (free-burning).
6. Buried burners, air-gas mixing devices, mixing machines, and compressors.

### Jets

The luminous and aerated jets are of differing types, and well-known in their application to domestic appliances. For simplicity in connexion with low temperature and low gas rate applications they can hardly be improved upon. The general tendency is to use the luminous or "neat gas" jets, for where air is entrained at a point adjacent to the gas orifice it is through a small hole which can easily be choked by dust accumulation, and in some cases the air/gas mixture then passes through a non-fire-back or silencing device which is also liable to choking. With luminous jets gas is supplied at a governed pressure appropriate to the optimum flame shape desired and burns with the air adjacent to the tip of the jet. The precise flame shape is defined by the formation of the orifice and jet tip as designed by the makers. Jet tips must be kept relatively cool, otherwise the gas can be cracked prior to free exit from the jet, or, with steatite tips, these can become parted from the brass casing of the jet proper. This imposes a limitation upon their use for commercial and industrial usage. A further limitation is the quantity of gas required per hour in a known combustion space, and the room available for their proper application. The low turn-down capacity of luminous jets makes them very suitable for automatic controls such as used for central heating boilers, &c.

### Injectors

A simple injector consists of a centrally disposed jet through which gas is passed at the velocity allowed by the gas supply pressure. The gas passes into a specially designed venturi opening where it entrains an appropriate quantity of air from the surrounding atmosphere, the mixture moving forward into a pipe or chamber at a kinetic energy sufficient to create a mixture pressure at the inlet of the final outlet nozzles or holes capable of producing a velocity greater than flame speed. Here it burns in free atmosphere or up to a limited working chamber pressure, from the point where velocity has decreased to the speed of flame propagation. The last point can generally be observed on any burner of this type, there being a small space between the tip of the burner nozzle and the commencement of the flame. This is not always due to velocity alone, since the characteristics of certain gases will give a similar effect, and the two should not, therefore, be confused. If the gas velocity is reduced by closing the cock below a certain point there will be a flash-back to the jet, which will then operate as a luminous jet. When lighting or shutting-off an injector it is thus necessary to close the air shutter to prevent a sharp minor explosion at the venturi opening due to over-aeration at the critical velocity point.

The normal atmospheric or natural-draught injector uses gas at governed district pressure as the entrainment agent, but gas or air at higher pressures can be used, although this is usually on larger injectors supplying a mixture to a large burner nozzle or a number of smaller nozzles. The simplest applications of injectors are on cookers and gas fires, the latter suffering in due course from the inherent entrainment of floor dust. In commercial practice it is extensively used for ring and bar burner applications, and in industrial applications for stoving ovens and small low temperature furnaces, up to, say, 1,000°C., with comparatively small production demand.

### Separate Air/Gas Entrances into Combustion Chambers

This refers to simple gas pipes led into closed chambers with flue outlets. If a draught is maintained through the chambers and air drawn around the pipes it is possible to maintain combustion at the end of the gas pipes. Obviously the setting of the gas and air cocks is critical, and for operating purposes it is rarely feasible. If air is supplied around the pipes under pressure the burner control is assisted, and limited furnace pressures can be obtained, as well as higher operating temperatures. In principle it is one of the oldest combustion systems to be operated, and by the use of air and gas ports has been employed on large continuous furnaces and glass tanks with every success, but not so on the small run of ordinary industrial furnaces.

### Nozzle Mixing

A natural development from the above is the use of burners which in themselves include the gas and air openings and are connected at their nozzle outlets to a miniature combustion chamber or tunnel where the air/gas mixture is completed and rapid combustion commences to take place. The gas and air must be under sufficient pressure to get into the combustion tunnel, requiring suitable valves or automatic devices to keep the mixture at the right gas/air ratio. With this type of equipment either air or gas, or both, may be preheated and relatively high pressures used. Burners may be individually adjusted or operated in groups. As no mixture is present except in the combustion tunnel, backfiring is impossible and a wide range of operation can be achieved. This system is used for glass tanks, kilns, steel heating, and large forge furnaces where luminous flame applications appear desirable. For such high temperature work where large areas of metal have to be evenly heated it is clearly advisable to make full use of the radiation from flames produced by carefully controlled retardation of diffusion and combustion. There would appear to be no difficulty in producing flames of 20-30 ft. long with carefully designed "diffusion" burners, and claims of up to 80 ft. long have been made.

### Flame-Retaining Burners (Free-Burning)

In some instances there is a demand for burner heads with a close air/gas ratio control over a wide range, capable of supporting combustion in free atmosphere conditions, as in the case of Meker burners, blast tip and torch burners, and refractory types of "surface" combustion burners. Some of these are made to operate at normal gas pressures, but the majority of industrial burners are fed with the correct air/gas mixture from premix equipment or machines.

### Buried Burners

In the majority of medium and large refractory built furnaces the burners are buried in the brickwork and sealed at the tips by the special high-temperature cement which forms the combustion tunnel. The air/gas mixture is supplied from one form or other of mixing device and is a complete mixture prior to reaching the burner nozzles, where it is discharged into the tunnels and rapid combustion commences as the issuing mixture velocity falls to the speed of flame propagation. This is distinctly different from the previous nozzle mixing arrangement where the gases issue from the nozzle to mix and burn in the combustion tunnel. We are now dealing with pre-mix before leaving the nozzle, and there is a lower limit, as with injector type burners, where back-firing can occur if the velocity of the air/gas stream is below flame speed, also, incidentally, if the buried burner end attains a temperature beyond the cooling effect of the flowing mixture stream sufficient to cause ignition prior to venting at the nozzle.

The original mixing equipment consisted of a "Y" or "Tee" mixer with air and gas at reasonably equal pressures, mixing at any stage of heat input being by manipulation of the air and gas control cocks or valves. This developed into a "Y" mixer with air at 14 in.-28 in. W.G. flowing through a central cone and inducing gas at normal pressures. These were crude, and quite effective, but very open to operational abuse, with considerable difficulty in either estimating or reproducing correct combustion or heat input conditions. Evolution has now produced mixing equipment where the air inspirates gas in predetermined proportions at any stage of the operational range, and the heat input is relative to the manifold pressure shown on a water gauge fitted between the outlet of the mixed and the burner nozzle, or group of burner nozzles common to one mixer. The same effect can be produced in a burner or burner manifold by using high pressure gas and entraining the requisite air, but the venturi mixer must be very carefully designed to give a wide operational range. Gas compressors throwing outlet pressures of 3-5 lb./sq.in. gauge are used for this purpose. Another method is to employ compressors which supply 60/40 air-gas, or 100% air-gas mixture at a pressure of 1-3 lb./sq.in. gauge pressure. The selection of the appropriate mixing device and the burner application to any particular furnace require careful consideration on the part of the proposer, and may be dependent on both local conditions and the capital expenditure involved. Some of the essential features of the modern mixing devices are that they allow close control of furnace atmospheres derived from the products of combustion, they allow heating cycles to be accurately reproduced at will, and lend themselves to fully automatic control of temperatures. They can be applied to practically every type of industrial furnace irrespective of size or temperature demand.

## 3. Types of Furnaces, Construction and Temperature Range

There is considerable diversity in the types of furnaces and furnace applications which make it very difficult to state that one particular furnace, and that alone, is the correct unit for doing a specific process. For example, a piece of steel can be heated satisfactorily to 600° C. in a normal type of refractory lined furnace. It can be heated just as well in a bath of molten lead or in a forced-air circulation type of oven furnace with no refractory lining. As particular processes will be discussed at a later stage it may be as well to give here a broad outline only of general types of furnace and the approximate temperatures at which they operate.

### 1. Liquid Tanks, Pots, and Baths

There are numerous operations where heated liquids are used for reducing or oxidizing the surfaces of materials, or putting protective coatings upon materials, or hardening. There are also liquids produced by the melting of basic materials or alloy metals for the purpose of pouring into moulds or shapes, or for the preparation of final mixtures. The type of container used depends upon several factors, such as the quantity of liquid considered desirable, the size of work involved in dipping processes, the type of liquid concerned, and the external and internal temperatures

involved. Where hot water and non-corrosive liquids are used at 60°-180° F. the tanks can be of welded M.S. sheets. For oil and salts at 200°-600° F. M.S. plate can be used, but from 600°-1,800° F. either very heavy M.S. plate, or cast iron is employed. The above tanks or baths use liquid for heating immersed articles where evenness of heating is essential to prevent distortion, or for straight dipping for hardening purposes where the liquid must be at a defined temperature to prevent thermal shock and damage to hot articles upon immersion—*i.e.*, tempering or hardening. The type of liquid used depends upon temperature limitations. Obviously water cannot be used above about 180° F.; the higher limit for oil is 600° F., after which special salt preparations, or lead, must be used. Where acid solutions or other corrosive liquids are used the container must be made of suitable anti-corrosive metal, lined with lead, or made of wood or special tiles. Low temperature heating is usually done by luminous jets, drilled bar rails, or by immersion heating elements. Higher temperatures and outputs require one or other of the air/gas burner equipments.

The melting and mixing of oils and varnishes is usually done in circular kettles having copper or stainless steel bases, with M.S. for the main body. Heating is always done at the base with natural draught, or special air/gas burners, and the operating demands can be critical with certain mixtures where exothermic reactions in the material require a quick change from heating to cooling.

The melting of load and non-ferrous metals such as aluminium, white metal, and similar alloys is frequently done in cast iron pots.

Surface hardening of steel can be done by immersing it in liquid compounds such as salt and carbon, cyanides of sodium and potassium, and special proprietary compounds, usually from 1,100°-1,700° F.

## Air-Heating Units

The drying of salts and powders, grain, sand, cores, moulds, &c., is almost exclusively done by means of numerous changes of air heated to appropriate temperatures, although a limited amount of infra-red drying is now being used, but even this requires a proportion of air convection currents. The materials can be dried in conveyor ovens or box type ovens, mostly made of sheet steel suitably insulated, except in the case of large core ovens and the like. As the temperatures rarely exceed 500° F. the heating equipment can be natural draught luminous jets or drilled bar rails. On some larger ovens recirculated hot air from a special combustion chamber is used.

Of recent years hot air has been used for the tempering and hardening of steel articles, annealing of glass, &c., by means of M.S. box ovens fitted with recirculating air fans giving many air changes per hour, and using fully automatically controlled natural draught burner equipment. This has proved highly satisfactory for working temperatures up to 800° C.

## Box Ovens

Standard box ovens have proved very effective for many drying operations, the stoving of paints and lacquers, small core drying, &c. They usually employ luminous jet or drilled bar rail burners.

## Small and Medium Furnaces

These start with the small laboratory muffle furnaces and range up to the larger sizes of oven type furnaces. The essential difference between these two types is that in a muffle furnace the articles to be heated are protected by the refractory or metallic muffle from contact with the products of combustion, and any other type of special atmosphere can be introduced if desired, whereas in the oven furnace the articles are exposed to contact with the products of combustion. In actual practice the major portion of process work is heated in oven or other open types of furnace. In broad principle these furnaces comprise an external casing of M.S. sheet and angles, or cast iron, within which is built an insulating and refractory lining to an appropriate shape and size. They are usually for operation up to 1,100° C., and the burner equipment is of the low pressure natural draught injector or air/gas mixing type. Firing is either below-hearth or up the side-walls to avoid flame contact on the product. Some small furnaces, such as tool-hardening furnaces, operate at temperatures up to 1,300° C. The material has to be preheated prior to insertion in the high temperature, so this type of furnace has a preheating chamber built above the high temperature chamber and the waste heat from the latter is used to heat the former. Where special furnace atmospheres are required, apart from the products of combustion it is necessary to use a muffle, which may be of metallic or refractory material, dependent upon the maximum temperature to which it may be subjected.

## Large Furnaces

The size of a furnace depends upon several factors. The primary dimensions to be ascertained are the width and length of the furnace hearth and the height from hearth to rise or crown of arch. For example, when large single articles like M.S. fabricated pressure vessels or cast mill rolls have to be heated, all three dimensions are of prime importance; for large flat plates the width and length are affected, as some plates may be circular and others rectangular; and when M.S. billets of, say 6 in. square section x 3 ft. 6 in. in length have to be heated and discharged at a continuous rate of one billet per 7½ mins. the width and length of a zonal furnace are of basic importance. Having assessed the working hearth for the largest piece of work to be heated the remaining furnace dimensions spread outwards, upwards, and in lesser degree in the length. Thus, a roll heating furnace may be 7 ft. 6 in. wide x 6 ft. high x 25 ft. long internally; a plate furnace may be 15 ft. square x 3 ft. 6 in. high or 7 ft. wide x 25 ft. long x 3 ft. 6 in. high; and a shipyard bar or frame heating furnace 3 ft. 6 in. wide x 1 ft. 6 in. high x 9 ft. long. All such large units could be cased with M.S. plates or C.I. plates, and where the interior refractory lining is backed with insulation this is often done; but in many instances the refractory structure has to be of a substance which is self-supporting under temperature, and the heat loss through the relevant thickness of the side walls is of such small dimensions that insulation is not so effective as in smaller furnaces and casings are therefore not so essential. In these cases the arch, and possibly hearth, side thrust is taken by longitudinal channels, and both cased and uncased furnaces of these dimensions are then supported at sides and ends by vertical buckstaves heeled into the foundations at the base and held at the top ends by tie-rods.

These large furnaces may operate in the 300°-1,300°C. temperature range, but mainly in the 600°-1,100°C range. They are generally heated by numerous burners fitted in and through the side walls, either singly or in groups, the large heat input demand and operating conditions being such that they inevitably require to be of the air/gas mixing type variants. They lend themselves admirably to semi-automatic or fully automatic burner control, and wherever practicable the latter is definitely the modern trend.

## Conclusion

From the total picture of combustion and its applications the importance of its function in modern commercial and industrial process work will be realized. As far as town gas is concerned the whole of the sales of gas for these purposes is fundamentally bound up with the efficiency of combustion, so that development of this business and the revenues from it are logically built upon this foundation.

## Bibliography

Acknowledgment of sources of information:
"Combustion," American Gas Association.
"Combustion Principles," D. A. Campbell, Bryant Heater Company, Cleveland, Ohio.
"Heat Values in Commercial Fuels," Foster's Pocket Reference Books (Mechanical Engineering).
"Town Gas and the Heating Engineer," W. S. Moore, A.M.I.H.V.E.
Books for further study:
"Combustion," American Gas Association.
"Fuel Flue Gases," American Gas Association.
"Fuels and their Combustion," Haslam and Russell.
"Gaseous Fuels," Louis Shnidman.
"Gas Analysis and Testing of Gaseous Materials," V. J. Altieri.

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# THE CALL TO ADVERTISERS

In an address on "The Call to Advertisers in 1949," to the Incorporated Society of British Advertisers on Jan. 5, Mr. D. de Grunwald, Chairman of the Society, referred to the effects of changing conditions in home and overseas markets and commended the revised terms of the voluntary plan for the limitation of advertising which comes into operation on Mar. 1. The financial restrictions of the old plan had been withdrawn, but it was required that advertisers should exercise reasonable economy in their campaigns, and all would be in favour of that suggestion.

He did not interpret "reasonable economy" as implying timidity or lack of enterprise. Advertising was a vital factor in economic life. Advertisers could be bold, imaginative, and hard-hitting, and could accomplish all that they wanted their advertising to do, but they should remember the requirements of national interest and contribute so far as possible to the fight for national recovery.

The new plan was a great opportunity and a great test—an opportunity because it freed advertisers from irksome limitations and calculations, and a test because the Government would look to advertisers to make good use of their freedom.

To accomplish their task, advertisers must understand the full implications of changing conditions—that the era was one of planned economy in which there was need to preserve greater flexibility. The process by which the Chancellor of the Exchequer, in his last Budget, converted an inflationary tendency into disinflation was now turning customers and sellers into people with little money available for anything but the necessities of life. If current advertising could be designed to present the merits of a product, and also to speed national recovery, the influence would help the approach to the position in which the public would not only want, but would be in a position to buy, goods.

# GAS INDUSTRY AND WAR DAMAGE

THE War Damage (Public Utility Undertakings, &c.) Bill, of which we gave a brief summary in the "JOURNAL" of Dec. 29, 1948 (p. 704), gives effect substantially to arrangements made in the course of a long series of negotiations starting in 1941 between the Treasury, the Ministry of Fuel and Power, and the British Gas Council, the National Gas Council, and the Conjoint Conference of Public Utility Associations. The Bill divides public utilities into eight groups and specifies the aggregate of gross amounts of payment in respect of undertakings in each group. The gas group includes all statutory undertakings and non-statutory gas undertakings if (a) the principal or only business of those undertakings is the carrying on of the gas undertakings; or (b) the quantity of gas sold during 1945 exceeded 150 mill. cu.ft.

Gas and water undertakings of a composite company are to be treated as separate statutory undertakings. It is pointed out in a report issued to member undertakings by the British Gas Council that the Bill applies to war damage suffered in respect of (a) land which was held by a gas undertaking mainly or exclusively for the purpose of carrying on the undertaking immediately before the occurrence of the damage; (b) the distribution system; (c) goods insurable under the Business Scheme established by Part II of the War Damage Act, 1943; and (d) commodities consisting of gas and materials and ingredients for gas which at the time of the damage were in the United Kingdom or were in transit by ships not due to call at any port outside the United Kingdom.

Existing War Damage legislation, *i.e.*, the War Damage Act, 1943, and the War Risks Insurance Act, 1939, will be repealed with respect to these items and will be superseded by the provisions of the Bill. Property which does not fall within the items set out remain subject to existing war damage legislation. Land occupied by a tenant (other than a public utility) is not covered by the Bill even when the occupation is for the purposes connected with the purposes of a public utility undertaking.

## Payments

The aggregate of the gross amount of payments in respect of undertakings in the gas group is fixed at £12,211,142. The amount has been calculated from the returns obtained by the Ministry as a result of the questionnaire agreed between the Ministry and the British Gas Council and circulated in 1946. The Treasury will pay 72½% of the gross amount of payments, *i.e.*, £8,853,078.

An amount equal to 27½% of the aggregate amount of payments, *i.e.*, £3,358,064, will be raised from the industry in respect of all undertakings which carried on business during the period from Sept. 3, 1939, to May 8, 1945. The amount payable by individual undertakings will be fixed by an Order to be made by the Treasury. If the amount payable by undertakings is assessed in accordance with the formula recommended by the British Gas Council (*i.e.*, by reference to the average annual amount of gas sold during the years 1941-44, subject to certain exceptions) the amount payable will represent approximately 0.4729d. per therm of gas. The estimate given by the British Gas Council in 1947 on the facts then available was 0.4d. per therm.

Before making payments, the Treasury will deduct from the gross payments to be made to undertakings all sums advanced on account of final payment—such, for instance, as sums advanced under Section 70 (3) (b) of the War Damage Act, 1943, and the difference will be known as the net payment.

Where the net payment payable by the Treasury to an undertaking exceeds the amount of the contribution to be made by that undertaking, the payment will be equal to the difference. Where the amount of contribution payable by an undertaking exceeds the net amount to be received from the Treasury, the undertaking will pay the difference. Undertakings not entitled to receive payment will pay the full amount of contribution due from them. All contributions payable by undertakings are subject to the deductions to which reference is made in the next paragraph.

## Contributions and Premiums Already Paid

In estimating the amount due from undertakings as contributions, credit will be given for all premiums paid under the Business Scheme and under the Commodities Insurance Scheme in respect of gas and materials and ingredients for such gas. It will be remembered that statutory undertakings were entitled on a voluntary basis to insure goods under the Business Scheme, whereas non-statutory undertakings were compelled so to do. Credit will therefore be given in respect of all premiums paid under the Business Scheme. Gas and materials and ingredients for gas will be covered by the Bill for the whole period of the war notwithstanding the fact that gas, &c., was not originally insurable under the Commodities Insurance Scheme.

Contributions to be made by gas undertakings are to be treated for all purposes as outgoings of a capital nature. The Bill authorizes undertakings (in addition to and not in substitution for any other powers they may possess) to raise money by borrowing on mortgage or by the issue of debentures or of stocks and shares or otherwise for the purpose of discharging their liabilities in respect of such contributions.

In the case of the gas industry it is improbable that any payments will fall to be made or contributions to be levied before the vesting date to be appointed under the Gas Act, 1948. Normally, payments are to be made to the body carrying on the undertaking at the time of the damage and contributions are to be paid by the body carrying on the business on May 8, 1945. Where, however, there is a change of ownership or any cesser of carrying on the business, or other circumstances, the Treasury may make payments to and levy contributions upon any other body if such course appears to be requisite or equitable.

The rights and liabilities of an undertaking under the Bill are to be included in the rights and liabilities which will be transferred from gas undertakings to the Area Boards on the nationalization of the gas industry.

The Treasury is to establish a War Damage (Public Utility Undertakings) Account and all payments are to be made into or out of that account. The account is to be examined and certified by the Comptroller and Auditor-General on Nov. 13 of each year and is to be laid before Parliament.

## Miscellaneous

The Bill contains miscellaneous provisions, including the following: (a) Air raid shelters constructed by grants under Section 38 of the Civil Defence Act, 1939, are to rank for payment under the Bill; (b) the question whether plant or machinery is to be treated as land or goods is to be determined by reference to the Plant and Machinery (Valuation for Rating) Order, 1947; (c) the War Damage Act, 1943, or the Bill, may be modified by Order; (d) contributions and the cost of war damage repairs are not to be allowable deductions in respect of income tax and excess profits tax assessment.

The Bill contains five schedules. Schedule 1 defines public utility undertakings and provides for their grouping; Schedule 2 provides for the setting-off of payments made on account or contributions already paid from final liability; and Schedule 4 deals with the adjustment of the relationship between landlords, tenants, and mortgagees.

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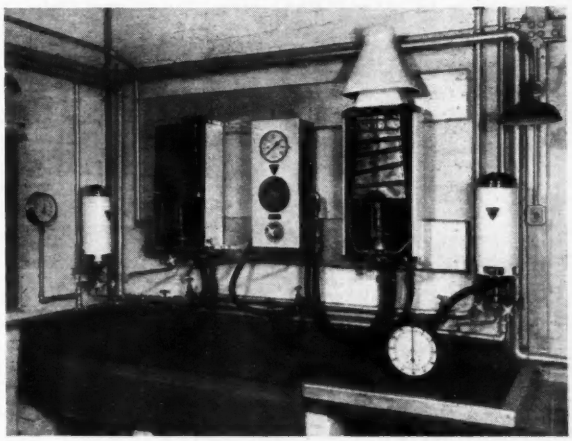
# A MODERN TESTING AND REPAIR SHOP

The Bury St. Edmunds Gas Company has shown considerable ingenuity in converting an obsolete tar plant into a modern testing and repair shop for water heaters, meters, and other gas appliances. Much thought has been given to the selection of suitable apparatus. A mercurial governor which can be set to any required pressure, and a large meter showing hourly gas rate with minute observations, have been installed. Water at town pressure is available, and there is also a tank supply with a 20 ft. head.



*The water heater testing section at the works of the Bury St. Edmunds Gas Company.*

A feature of the station is the use that is being made of the Adcot controlled hot water unit which, although not designed for this specific purpose, is proving of value in testing the efficiency of water heaters after overhaul and repair before they are re-installed on the district. A complete record is kept of all heaters passing through the station. Other features include a high-speed electric drill, grinder, and polisher.

Permac
METAL-TO-METAL JOINTING MATERIAL

**Ever since 1913 "PERMAC," the original Metal-to-Metal Jointing, has been holding up difficult joints in Gas Works and on Coke Oven Plants all over the world. Equally suitable for any joint—steam, water, gas, oil, benzol, ammonia, etc.—screw pipe or flange.**

*Instant full pressure when the joint is made*

THOMAS & BISHOP LTD.
39, ARTHUR ROAD, LONDON, S.W.19.

## OVERSEAS RESULTS

### Consumers' Gas Company of Toronto

The 100th annual report, covering the year to Sept. 30, 1948, records an increase of 4.5% in gas sales over the previous year. A maximum day's production now is six times the total output for the Company's entire charter year of 1848. Although the supply of appliances improved slightly it was not sufficient to meet the growing demand; nevertheless, the revenue from sales of appliances was greater than in the previous year. To mark the centenary the report is accompanied by a handsome brochure reviewing in word and picture the past 100 years' operations of the Company.

### Perth (Western Australia) Gas Department

The annual report and statement of accounts of the City of Perth (Western Australia) Electricity and Gas Department for the year ended Sept. 30, 1948, show that the total make of gas was 948,791,000 cu.ft., an increase of 57,906,000 cu.ft. over the previous year, and gas sales were 861,557,043 cu.ft., an increase of 42,987,383 cu.ft. The maximum day's output during the year was 3,161,000 cu.ft. on Aug. 14. Meters in use increased by 1,807 to a new record of 40,751, and the total length of mains rose to 464.56 miles. Total receipts at £989,383 were £60,657 higher than in the previous year, but gross profit fell by £10,697 to a total of £106,709. Interest, superannuation, and sinking fund charges were £35,554, leaving for allocation the sum of £71,155. Deducting £16,852 for contribution to street lighting, £30,000 contribution to general revenue, and £5,961 for payroll taxation, a balance of £18,343 is left to be carried to reserves for use in the Department. Mr. F. C. Edmondson, General Manager, concludes his report with the statement that high price and poor quality of coal had its effect on the year's working, and this, combined with the increasing incidence of the 40-hour week, high wages, and increase in all other costs, leaves no option but to increase the price of gas in common with other undertakings in Australia.

## GAS STOCKS & SHARES

The New Year opened in subdued mood in stock markets, though business at the beginning of the week in British Funds was fairly active, with few and slight price movements. The first Stock Exchange account of the year started cheerfully on Wednesday, with a total of 7,269 bargains against 5,939 on Tuesday and 4,360 on the previous Wednesday. The total dealings for the week ended Thursday evening were 31,992, compared with 49,294 in the first week of 1948.

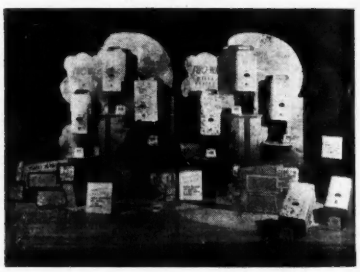
Industrial securities attracted more enquiries and after a slight fall in the early part of the week the general average of prices recovered to 121.3, against 125.1 for the corresponding day last year. The *Financial Times* Government Security index rose to 113.71, compared with 112.93 a year ago.

Referring to recent articles in the Press on break-up values of shares *qua* collieries, coke ovens, &c., in regard to potential compensation under the Coal Industry Nationalization Act, the Directors of the Old Silkstone Collieries, Ltd., and the Wharncliffe Silkstone Colliery Co., Ltd., announce that in view of the many complexities attached to valuations, neither they nor in their opinion anyone else can at this stage, when even district valuation awards at Stage 2 are still unknown, make a reliable or useful forecast of the compensation that will ultimately fall to their shareholders.

The week's total of 212 transactions in gas stocks was slightly below recent averages. For the first week of 1948 the total was 286, but the number rose rapidly in succeeding weeks. Price changes were as follows:

OFFICIAL LIST

| | | |
|---|---|---|
| Assoc. Gas & Water, deferred ... | 22/6 — 23/6 | + 3d. |
| Gas Light and Coke, 3¾ p.c. red. pref. (xd. Jan. 5) | 96½— 99½ | — 1 |
| Sheffield, 4 p.c. red. deb. (xd. Jan. 5) | 93 — 98 | — 1 |
| South Metropolitan, 5 p.c. red. deb. (xd. Jan. 5) | 97 —102 | — 1 |



*A special window display of the Ewart M. 75 sink geyser which has been prepared and designed by the Bournemouth Gas and Water Company and which appears in the windows of their showrooms.*

## TRADE CARDS

**TOM CARRINGTON & CO. LTD.**
Lyndon Toolworks, West Bromwich. T/N 0517 (2 lines).
"LYNDON" and "EGA-KUT"
SCREWING TOOLS;
TAPS; DIES; STOCKS AND DIES;
GROUND THREAD TAPS

**M. B. WILD & CO. LTD.**
Mechanical Engineers, Argyle Street, Birmingham 7. T/N East 0472.
CAPSTANS. BY-PRODUCTS COKE OVEN MACHINERY. ELEVATORS. CONVEYORS. WAGON TIPPLERS.

**CHARLES WINN & CO., LTD.**
Granville Street, Birmingham, 1. T/N Midland 3695 (4 lines). T/A Winn, Birmingham.
BACK PRESSURE GAS VALVES, SIZES 1 in. to 12 in. FOR USE WITH AIR BLAST IN INDUSTRIAL AND OTHER GAS-HEATED APPARATUS.

**NATIONAL ENAMELS LTD.**
53, Norman Road, Greenwich, London S.E.10. T/N Greenwich 2266-7.
Our COOKER LININGS, CROWN TRAYS and SPLASHBACKS have been well proved by the Gas Industry.